

# **HP StorageWorks XP12000 Disk Array site preparation guide**

second edition (March 2005)

part number: AE002-96008

This guide contains site preparation information for the HP StorageWorks XP12000 Disk Array.



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# About this guide

This guide is intended for anyone participating in preparing a site for the installation of an HP StorageWorks XP12000 Disk Array.

Unless otherwise noted, the term *disk array* refers to the HP StorageWorks XP12000 Disk Array.

## Related information

For related product documentation, see the *HP StorageWorks XP12000 Disk Array Owner's Guide* on the HP web site: [www.hp.com](http://www.hp.com).

## Document conventions and symbols

Table 1. Document conventions

| Convention   | Element   |
|--|---|
| Blue text (Figure 1)   | Cross-reference links   |
| <b>Bold</b>  | Menu items, button names, key names, tab names, and group box names |
| <i>Italics</i>   | Text emphasis and document titles                                   |
| Blue underlined sans serif font ( <a href="http://www.hp.com">www.hp.com</a> ) | Web site addresses  |

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**Caution** Failure to follow directions could result in hardware or software damage.

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### Warning

Failure to follow directions could result in personal injury or death.

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## Getting help

If you have additional questions, contact your HP sales representative (HP SR) or visit the HP web site: [www.hp.com](http://www.hp.com).

## HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the location nearest you. The HP web site lists telephone numbers for worldwide technical support: [www.hp.com/country/us/eng/support.html](http://www.hp.com/country/us/eng/support.html).

Have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

## HP storage web site

For the most current information about HP StorageWorks XP products: <http://h18006.www1.hp.com/storage/arraysystems.html>.



## HP authorized reseller

To obtain the name of your nearest HP authorized reseller:

United States      1-800-345-1518

Canada             1-800-263-5868

elsewhere          See the HP web site for locations and telephone  
numbers: [www.hp.com](http://www.hp.com)

## Revision history

|                |                 |
|----------------|-----------------|
| September 2004 | First edition.  |
| March 2005     | Second edition. |

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# Site Prep Team and Tasks

The objective of a site prep is to prepare your site for the successful and timely installation of the HP XP12000 disk array. Proper site preparation is vital for the reliability of the disk array.

Site prep involves a careful balance of equipment design criteria, site environmental variables, your business needs, and your budget constraints.

In addition to this guide, other site prep resources may be available to you. The HP service organization is committed to making sure you receive maximum benefit from your disk array. HP representatives will guide and assist you throughout the site prep process.

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## The site prep team

The site prep team plans, schedules, and completes all tasks necessary to prepare your site for successful disk array installation.

The site prep team consists of HP representatives and you, the customer.

### HP representatives

The HP team includes various HP representatives who have the training, knowledge, experience, tools, and parts required to install and maintain XP disk arrays. This team:

- Helps you to determine and implement the site requirements for your specific site and array configuration
- Coordinates all HP resources to ensure successful delivery and installation of the disk array

Your HP SR is your primary point of contact with HP during the site preparation process.

### Customer

As part of the site prep team, your responsibilities include planning and preparing a suitable environment for the disk array, and scheduling equipment delivery and installation. However, HP representatives are available to help you throughout the site prep process. Your internal site team may include personnel specializing in your site computer room, such as your storage administrator and your site electrician.

---

## Site prep tasks

Contact your HP SR for assistance at any time during the site prep process.

1. If you have not printed a copy of this guide, HP recommends that you print at least [Chapter 2](#) and the “Site prep checklist” ([page 13](#)). Working from printed copies makes it easier to use the tools provided and provides hard copy documents that you can keep for your records.
2. Carefully review [Chapter 2](#) to understand the site requirements for the disk array. If you plan to connect additional external storage to the XP12000, be sure to take the requirements of that storage into account. See the documentation for the external system.
3. Use the information, instructions, and tools in [Chapter 2](#) to determine site requirements for the specific disk array components you ordered.
4. On the site prep checklist, answer each item “Yes” or “No” as it relates to your site. The checklist includes references to the pages in this guide where you can find more information on each item.
5. Checklist items that require a “Yes” answer are marked with asterisks (\*). If you answer “No” for any of these items, your site does not meet site requirements for the disk array. Using the information in [Chapter 2](#), correct the site environment so that you can answer “Yes” for each of these items.
6. When your site meets all site requirements, contact your HP SR to coordinate delivery of the disk array equipment.
7. If you choose to unpack the equipment cartons without HP supervision, follow the instructions in [Chapter 3](#).
8. Contact the HP SR to schedule disk array installation and configuration.

## Site prep checklist

Checklist items that require a “Yes” answer are marked with asterisks (\*). The customer summary information is included for the benefit of HP representatives, who will help you complete the checklist.

| <b>Customer summary</b>   |                            |                          |                           |
|---|----------------------------|--------------------------|---------------------------|
| Customer:   |                            | Date:                    |                           |
| Address:  |                            |                          |                           |
| Contact:  |                            | Phone:                   |                           |
| <b>HP summary</b>   |                            |                          |                           |
| HP SR:  |                            | Phone:                   |                           |
| HP representative:  |                            | Phone:                   |                           |
| <b>Safety</b>   | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>          |
| Is there a fire protection system in the computer room?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 27</a>   |
| Is the computer room free of any equipment servicing hazards (for example, electrical or data cables that obstruct access)? | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 27</a>   |
| <b>Computer room space planning</b>   | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>          |
| Is the existing floor plan documented?  | <input type="checkbox"/>   | <input type="checkbox"/> | <a href="#">page 32</a>   |
| Has a new floor plan been developed to include the new array?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 32</a>   |
| Does the new floor plan include adequate space for airflow and servicing needs?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 32</a>   |
| Does the new floor plan include the clearance required for the floor's load rating?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 33</a>   |
| <b>Computer room infrastructure</b>   | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>          |
| Is the computer room structurally complete (walls, floor, air conditioning system, and so on)?                              | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">Chapter 2</a> |
| Is the raised floor adequate for the equipment load?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 28</a>   |
| Is antistatic flooring or mats installed?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 29</a>   |
| Are there cutouts or channels for cable routing?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 29</a>   |
| Is there a dedicated analog telephone line for "phone home" configuration?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 52</a>   |
| Is a telephone line available for HP representative use?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 52</a>   |
| Is a private LAN available?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 52</a>   |

| <b>Computer room environment</b>  | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>                     |
|---|----------------------------|--------------------------|--------------------------------------|
| Can the temperature be maintained between 16° and 32° C?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 47</a>              |
| Can temperature changes be held to less than 10° C per hour?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 47</a>              |
| Can the humidity level be maintained between 20% and 80%?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 47</a>              |
| Is the computer room protected against dust, pollution, and metallic particulate contamination?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 50</a>              |
| Does the computer room support other environmental considerations (such as vibration and acoustics)?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 48–<br/>page 50</a> |
| <b>Computer room electrical</b>   | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>                     |
| Are two AC outlets, on different lines, available for the equipment?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 53</a>              |
| Does the input voltage correspond to the DKC and DKU equipment specifications?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 53</a>              |
| Are the input circuit breakers adequate for equipment loads?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 53</a>              |
| Does the input frequency correspond to equipment specifications?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 54</a>              |
| Is an appropriate uninterruptible power supply (UPS) strategy in place?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 58</a>              |
| If lightning arresters are recommended, are they installed?   | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 59</a>              |
| Have all sources of electrical interferences been corrected?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 59</a>              |
| <b>Building access and security</b>   | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>                     |
| Does the customer site have access control (for example, HP representatives will need an escort)?   | <input type="checkbox"/>   | <input type="checkbox"/> | NA                                   |
| Does the computer room have access control (for example, HP representatives will need a security code)?   | <input type="checkbox"/>   | <input type="checkbox"/> | NA                                   |
| Are all floors, stairs, elevators, stairwalkers, lifts, ramps, or ladders needed to move the equipment adequate to support its weight and size?                         | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 60</a>              |
| Will the equipment fit through all doors and corridors and in lifts?  | * <input type="checkbox"/> | <input type="checkbox"/> | <a href="#">page 60</a>              |
| Does the building have a loading dock? Maximum access height is ____ m.   | <input type="checkbox"/>   | <input type="checkbox"/> | NA                                   |
| <b>Additional equipment</b>   | <b>Yes</b>                 | <b>No</b>                | <b>Reference</b>                     |
| For any additional equipment required (for example, connectors, receptacles, cables, and any equipment not supplied by HP), is the equipment on site and ready for use? | * <input type="checkbox"/> | <input type="checkbox"/> | NA                                   |

## Site prep time allowances

The following site prep tasks may require several weeks:

- Acquiring required power connectors
- Arranging for an electrician
- Adding or modifying air conditioning systems
- Making building alterations
- Placing an order for data comm equipment

The time between placing an equipment order and actual delivery can vary. Contact your HP representative to determine the best estimated delivery dates.



---

# Site Requirements

Your site must meet the following requirements before HP can deliver and install the disk array:

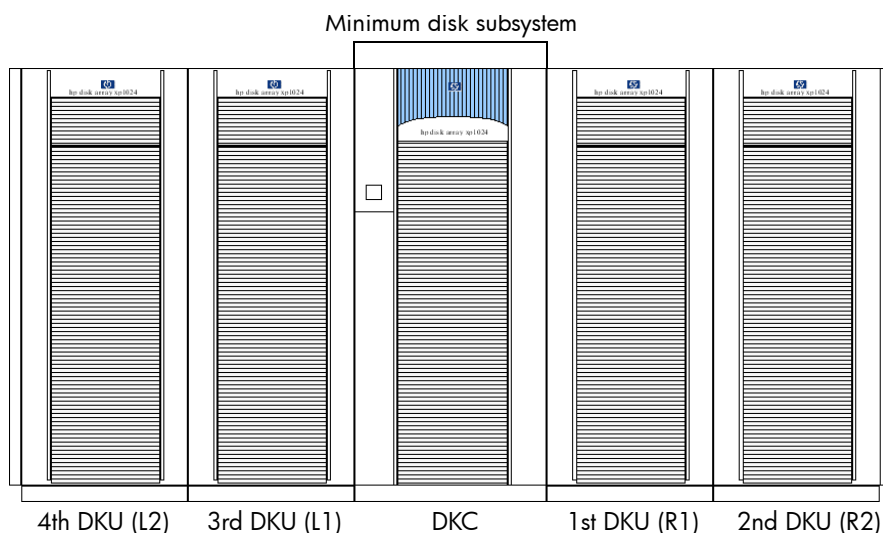
- General computer room requirements, [page 25](#)
- Safety requirements, [page 27](#)
- Raised floor requirements, [page 28](#)
- Space planning requirements, [page 32](#)
- Environmental requirements, [page 46](#)
- Data comm requirements, [page 52](#)
- Electrical requirements, [page 53](#)
- Delivery space requirements, [page 60](#)

---

## Disk array physical specifications

Use the information in this section to determine the total dimensions and weight for your specific array configuration. You will need these values to complete other procedures in this chapter.

The disk array includes one disk controller frame (DKC), and zero to four disk array frames (DKUs). The DKC contains the controller electronics for the disk array and some hard disk drives. The DKUs contain additional hard disk drives. [Figure 1](#) shows a disk array with four DKUs.



*Figure 1. Disk array minimum/maximum configuration*

Supported configurations are:

- One DKC (minimum configuration)
- One DKC and one DKU (R1)
- One DKC and two DKUs (R1 and R2 *or* R1 and L1)
- One DKC and three DKUs (R1, R2, and L1 *or* R1, L1, and L2)
- One DKC and four DKUs (maximum configuration)

# Dimensions

Use the packaged values when determining delivery space requirements (page 60), and unpackaged values during space planning (page 32).

Table 2. DKC and DKU dimensions

| Dimension | DKC Unpackaged    |       | DKC Packaged |       | DKU Unpackaged |       | DKU Packaged |       |
|-----------|-------------------|-------|--------------|-------|----------------|-------|--------------|-------|
|           | cm                | in    | cm           | in    | cm             | in    | cm           | in    |
| Width     | 78.2 <sup>1</sup> | 30.8  | 89           | 35.04 | 65             | 25.6  | 79           | 31.2  |
| Depth     | 92.5              | 36.42 | 112.5        | 44.3  | 92.5           | 36.42 | 112.5        | 44.3  |
| Height    | 186               | 73.23 | 202          | 79.52 | 186            | 73.23 | 202          | 79.52 |

1 Includes two side panels of 1.6 cm (0.63 in.) width each.

# Weights

Use the approximate packaged weights when determining delivery space requirements (page 60), and unpackaged weights to calculate the total weight of your configuration (page 22).

Table 3 (page 20) provides the approximate weights for:

- Minimum configuration — base cabinet without additional product components
- Maximum configuration — base cabinet fully populated with product components

Table 3. DKC and DKU weights

| Cabinet |                          | Minimum configuration |      | Maximum configuration |      |
|---------|--------------------------|-----------------------|------|-----------------------|------|
|         |                          | kg                    | lb   | kg                    | lb   |
| DKC     | Unpackaged               | 590                   | 1300 | 875                   | 1930 |
|         | Packaged <sup>1, 2</sup> | 689                   | 1518 | 989                   | 2180 |
| DKU     | Unpackaged               | 429                   | 945  | 739                   | 1630 |
|         | Packaged <sup>1, 3</sup> | 499                   | 1100 | 853                   | 1880 |

1 For shipments from the USA to locations outside the USA and Canada, add 59 kg (130 lb) for an international shipping crate.

2 Within the USA and Canada, most shipments use a special carrier process in which frames are shipped without pallets, ramps, and cartons. In these cases, the packaged weight is the unpackaged weight plus 23 kg (50 lb).

3 For upgrade DKU packaging (includes a ramp), add 29 kg (65 lb).

The main factor that increases total weight is the number of disk drives. The actual weight is the base cabinet weight plus the weight of all additional components installed.

Table 4 provides the approximate weights of additional disk array components when integrated into a DKC or DKU cabinet.

Table 4. Component weights

| Product     | Description                                    | kg   | lb |
|-------------|--|------|----|
| AE002A #001 | Three-phase 30A/60Hz for XP12000 DKC           | 22.6 | 50 |
| AE002A #002 | Three-phase 30A/50Hz for XP12000 DKC           | 20   | 44 |
| AE002A #003 | Single-phase 50A/60Hz for XP12000 DKC          | 21.3 | 47 |
| AE002A #004 | Single-phase 50A/50Hz for XP12000 DKC          | 17.2 | 38 |
| AE002A #005 | Single-phase 30A/60Hz for standard XP12000 DKC | 20   | 44 |
| AE002A #006 | Single-phase 30A/50Hz for standard XP12000 DKC | 18.6 | 41 |
| AE002A #007 | Single-phase 30A/60Hz for minimum XP12000 DKC  | 15.9 | 35 |
| AE002A #008 | Single-phase 30A/50Hz for minimum XP12000 DKC  | 15   | 33 |
| AE003A      | XP12000 SVP High Reliability Support Kit       | 8.6  | 19 |

Table 4. Component weights (continued)

| Product     | Description                                       | kg   | lb   |
|-------------|---|------|------|
| AE004A      | XP12000 Power Control Interface Kit for Mainframe | 0.5  | 1    |
| AE006A      | XP12000 16-port 1–2 Gbps FC SW CHIP pair          | 5    | 11   |
| AE007A      | XP12000 32-port 1–2 Gbps FC SW CHIP pair          | 5.9  | 13   |
| AE008A      | XP12000 FC SFP Transceiver LW                     | 0.03 | 0.05 |
| AE013A      | XP12000 8-port 1–2 Gbps FICON SW CHIP pair        | 5.9  | 13   |
| AE014A      | XP12000 8-port 1–2 Gbps FICON LW CHIP pair        | 5.9  | 13   |
| AE015A      | XP12000 16-port 1–2 Gbps FICON SW CHIP pair       | 5.9  | 13   |
| AE016A      | XP12000 16-port 1–2 Gbps FICON LW CHIP pair       | 5.9  | 13   |
| AE017A      | XP12000 16-port EXSA CHIP pair                    | 5.4  | 12   |
| AE024A      | XP12000 DKC Power Supply                          | 23.1 | 51   |
| AE025A      | XP12000 4 GB Cache Memory Module                  | 0.2  | 0.5  |
| AE027A      | XP12000 Cache Platform Board                      | 6.4  | 14   |
| AE028A      | XP12000 DKC-DKU Battery                           | 13.7 | 30   |
| AE030A      | XP12000 1 GB Shared Memory Module                 | 0.05 | 0.1  |
| AE032A      | XP12000 Shared Memory Platform Board              | 2.3  | 5    |
| AE033A      | XP12000 Cache Switch                              | 3.6  | 8    |
| AE034A      | XP12000 Standard Performance ACP pair             | 5    | 11   |
| AE040A      | XP12000 Cable Set for DKU R1, basic               | 3.2  | 7    |
| AE041A      | XP12000 Cable Set for DKU R1, high performance    | 4.1  | 9    |
| AE042A      | XP12000 Cable Set for DKU L1, basic               | 4.1  | 9    |
| AE043A      | XP12000 Cable Set for DKU L1, high performance    | 4.5  | 10   |
| AE044A      | XP12000 Cable Set for DKU R2 or L2                | 2.3  | 5    |
| AE045A #001 | Three-phase 30A/60Hz for XP12000 DKU              | 22.6 | 50   |
| AE045A #002 | Three-phase 30A/50Hz for XP12000 DKU              | 20   | 44   |
| AE045A #003 | Single-phase 50A/60Hz for XP12000 DKU             | 21.3 | 47   |

Table 4. Component weights (continued)

| Product     | Description                                    | kg   | lb |
|-------------|--|------|----|
| AE045A #004 | Single-phase 50A/50Hz for XP12000 DKU          | 17.2 | 38 |
| AE045A #005 | Single-phase 30A/60Hz for XP12000 DKU          | 20   | 44 |
| AE045A #006 | Single-phase 30A/50Hz for XP12000 DKU          | 18.6 | 41 |
| AE046A      | XP12000 High Performance FC-AL Disk Path       | 6.8  | 15 |
| AE050A      | XP12000 73 GB 15K rpm Array Group, four disks  | 4.5  | 10 |
| AE051A      | XP12000 146 GB 10K rpm Array Group, four disks | 4.1  | 9  |
| AE050AS     | XP12000 73 GB 15K rpm Spare Disk               | 1.4  | 3  |
| AE051AS     | XP12000 146 GB 10K rpm Spare Disk              | 0.9  | 2  |

## Calculating the weight of your disk array configuration

The total weight of your array configuration includes not just the DKC and DKU(s), but also the number of disk drives in each cabinet and any optional components. Your site must have adequate floor strength to support the total weight of the array, from the delivery area to the computer room.

Use the weight calculation worksheet ([page 23](#)) to calculate the total weight of your unpackaged array configuration, in your preferred units (kg or lb). See Table 6 ([page 24](#)) for an example of a completed worksheet.

Use the calculated total weight to estimate the required floor load rating for the computer room ([page 28](#)).

Table 5. Weight calculation worksheet

| Units (kg or lb)                   |             |                     |          |                 |
|------------------------------------|-------------|---------------------|----------|-----------------|
| Part Number                        | Description | Weight <sup>1</sup> | Quantity | Extended weight |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
|                                    |             | X                   | =        |                 |
| Total weight of your configuration |             |                     |          |                 |

1 From Table 3 (page 20) or Table 4 (page 20).

## Weight calculation example

Table 6. Weight calculation worksheet example

| Units (kg or lb)                                     |  |                     | Pounds (lb) |                 |
|--|--|---------------------|-------------|-----------------|
| Part Number  | Description                                    | Weight <sup>1</sup> | Quantity    | Extended weight |
| AE002A   | XP12000 Disk Control Frame (DKC)               | 1300 x              | 1 =         | 1300            |
| AE002A #001  | Three-phase 30A/60Hz for XP12000 DKC           | 50 x                | 1 =         | 50              |
| AE007A   | XP12000 32-port 1–2 Gbps FC SW CHIP pair       | 13 x                | 2 =         | 26              |
| AE013A   | XP12000 8-port 1–2 Gbps FICON SW CHIP pair     | 13 x                | 1 =         | 13              |
| AE024A   | XP12000 DKC Power Supply                       | 51 x                | 1 =         | 51              |
| AE025A   | XP12000 4 GB Cache Memory Module               | 0.5 x               | 8 =         | 4               |
| AE028A   | XP12000 DKC-DKU Battery                        | 30 x                | 4 =         | 120             |
| AE030A   | XP12000 1 GB Shared Memory Module              | 0.1 x               | 3 =         | 0.3             |
| AE033A   | XP12000 Cache Switch                           | 8 x                 | 1 =         | 8               |
| AE034A   | XP12000 Standard Performance ACP pair          | 11 x                | 2 =         | 22              |
| AE040A   | XP12000 Cable Set for DKU R1, basic            | 7 x                 | 1 =         | 7               |
| AE041A   | XP12000 Cable Set for DKU R1, high performance | 9 x                 | 1 =         | 9               |
| AE045A   | XP12000 Disk Array Frame (DKU)                 | 945 x               | 1 =         | 945             |
| AE045A #001  | Three-phase 30A/60Hz for XP12000 DKU           | 50 x                | 1 =         | 50              |
| AE046A   | XP12000 High Performance FC-AL Disk Path       | 15 x                | 1 =         | 15              |
| AE051A   | XP12000 146 GB 10K rpm Array Group, four disks | 9 x                 | 70 =        | 630             |
| AE051AS  | XP12000 146 GB 10K rpm Spare Disk              | 2 x                 | 4 =         | 8               |
| <b>Total unpackaged weight of your configuration</b> |  |                     |             | 3258.3          |

<sup>1</sup> From Table 3 (page 20) or Table 4 (page 20).



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## General computer room requirements

The goal of a computer room is to maintain an ideal environment for computer equipment, including XP disk arrays.

Make sure your computer room adheres to all national and local building codes for a data center/computer room environment.

HP recommends that you follow these general guidelines:

- Locate the computer room away from exterior walls of the building to avoid the heat gain from windows and exterior wall surfaces.
- When exterior windows are unavoidable, use windows that are double or triple glazed and shaded to prevent direct sunlight from entering the computer room.
- Maintain the computer room at a positive pressure relative to the surrounding spaces to reduce introduction of contaminants.
- Install a vapor barrier around the entire computer room envelope (floors/walls/ceiling) to help keep moisture out of the room. This is especially important if your computer room is located underground.
- Caulk and vapor-seal all pipes and cables that penetrate the computer room envelope.

## Preventing electrostatic discharge

Electrostatic discharge (ESD) can cause component damage during servicing operations.

Static charges occur when objects are separated or rubbed together. The voltage level of a static charge is determined by the following factors:

- Types of materials
- Relative humidity — low humidity contributes to undesirably high levels of electrostatic charges, which increases the ESD voltage potential.

- Rate of change — a standard air conditioner both cools and removes moisture from the air. The rate of change is how quickly the air in the room is dried. The drier the air, the more static is generated. If you do not use proper cooling equipment, air dryness can present problems.
- Separation — refers to the static discharge that can be generated when two objects are separated. For example, printer paper is often stored in cool dry conditions. If opened and used immediately, the act of removing the paper from its box generates static. To allow the static to discharge gradually over time, leave the box open in the computer room for several hours before use.

Follow these precautions to minimize possible ESD-induced failures in your computer room:

- Install conductive flooring (conductive adhesive must be used when laying tiles).
- Use conductive wax if waxed floors are installed.
- Ensure that all equipment and flooring are properly grounded and are at the same ground potential.
- Use conductive tables and chairs.
- Store spare electric parts in antistatic containers.
- Maintain recommended humidity level and airflow rates.

---

## Safety requirements

When making decisions concerning site safety, your first concern should be the safety of your personnel and then the safety of your equipment.

Fundamental safeguards for disk arrays should include a site well away from any sources of potential damage.

If you have any questions on site safety, consult your HP representative, your insurance carrier, and local building inspectors for safety recommendations.

### Fire safety

Do not install or operate the disk array in an environment where there is a risk of fire or explosion due to the presence of highly flammable gases, volatile liquids, or combustible dust.

Consult your insurance carrier and local fire department for fire safety suggestions. They can analyze your existing fire control systems and advise you on any required changes. If you are building a new site or making structural changes to an existing site, consult your local building codes for fire prevention and protection guidelines.

### Equipment servicing hazards

Your staff and HP service personnel require safe access to the disk array. Running electrical and data communication cables underneath your computer room's raised floor is the best way to ensure that they do not create a safety hazard.

---

## Raised floor requirements

The computer room floor must be able to support the total weight of the equipment as well as localized weight at each caster or foot of the equipment cabinets. A common method of preparing an adequate floor for a computer room is to construct a raised floor over the building floor. A raised floor:

- Allows weight to be spread evenly across the floor
- Provides an under-floor area for running interconnecting cables conveniently and unobtrusively
- Allows optimum distribution of conditioned air



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### Warning

If metal is used in the construction of the raised floor, ensure that there is a common ground connection between the raised floor and main floor to avoid possible build up of different voltage potentials. Failure to comply can result in serious injury to personnel and damage to equipment.

---

Requirements for raised floors:

- Raised floor access ramps must not exceed a 10° slope.
- Use a 10- to 12-inch raised floor system for the most favorable room air distribution system.
- Grid panels must be at least 45 x 45 cm (17.72 x 17.72 in).
- The floor must have a load rating between 300 and 500 kg per square meter (553 to 921.7 lb per square yard, or 61.4 to 102.4 lb per square foot). The maximum point floor loading is 500 kg (1102.3 lb).

To estimate the load rating you need for your floor, consider the total weight of all of these items:

- The disk array; see “Weights” ([page 19](#))
- Other equipment

- Furniture such as desks, chairs, and storage cabinets
- Computer room personnel
- Moving equipment such as forklifts, dollies, and similar items

The lower the floor load rating, the more clearance is required around the array to distribute the equipment weight correctly. If your computer room is too small to allow for minimum required clearance around the array, you may need to increase the floor load rating. For more on required clearance, see “Floor clearance” ([page 33](#)).

## Floor covering

HP recommends the use of a tiled raised floor.

---

|                |   |
|----------------|---|
| <b>Caution</b> | <i>HP strongly discourages the use of carpeting, including antistatic varieties, within 6.0 m (20 ft.) of the disk array. Over time, carpeting may shed dust that can cause problems with the disk array.</i> |
|----------------|---|

---

---

|                |  |
|----------------|--|
| <b>Caution</b> | <i>If your computer room has carpeting, place static discharge mats where personnel must walk across them before touching any part of the array. Failure to comply with this precaution can result in equipment damage through static discharge.</i> |
|----------------|--|

---

## Floor cutouts

Figure 2 ([page 30](#)) and Figure 3 ([page 31](#)) show the locations of floor cutouts under the DKC and DKU. Basically, position floor cutouts toward the center of the cabinet. The position may be off-center as long as the cutout is within the allowable range and allows smooth entrance of an external cable (check the relationship between the position of the cutout and the opening on the bottom of the cabinet).

Units = cm

⊕ caster  
+ foot

1.6 1.6

75

40 recommended  
34 to 45 allowed

21

5.25

25 recommended  
18 to 40.5 allowed

45

25 recommended  
18 to 40.5 allowed

6.25

6.5

17.9

78.5

55.7

DKC

Cutout

Cutout

18.9

7.5

56.2

64.8

11

6.7

92.5

Front

## DKU floor cutout

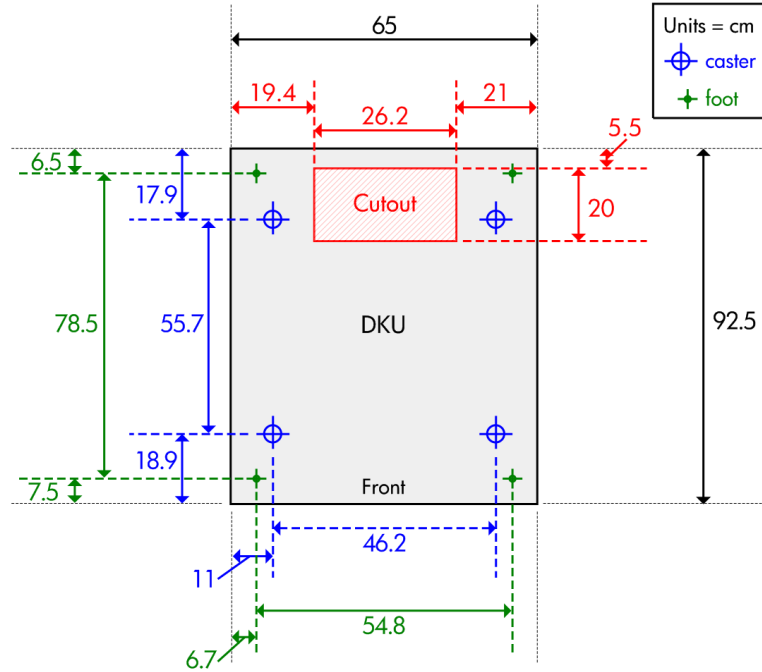


Figure 3. DKU floor cutout

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# Space planning requirements

Space planning involves making sure that your computer room:

- Is large enough to hold the new array and other equipment and furniture
- Provides minimum clearance around the array for service access and to ensure proper weight distribution on the computer room's floor
- Includes correctly positioned floor cutouts for the array's power and data cables

## The space planning process

1. Document your computer room's existing floorplan, including the locations of:
  - Immovable objects, such as structural support columns
  - Walls
  - All equipment, furniture, cabinets, racks, data comm equipment, and systems
  - Floor cutouts
  - Electrical outlets
  - Interconnecting cables and power cords, including lengths
  - Floor vents
2. Develop a new floorplan that includes the locations of:
  - Immovable objects from your existing floorplan
  - Walls
  - The array with required clearance; see "Floor clearance" ([page 33](#))
  - All other equipment, furniture, cabinets, racks, data comm equipment, and systems
  - Floor cutouts; see "Floor cutouts" ([page 29](#))
  - Electrical outlets



- Interconnecting cables and power cords (keep cables away from traffic areas to help prevent accidents and equipment failures)
  - Floor vents
  - Enough space and lighting for people to work effectively on a daily basis and for periodic equipment servicing
  - Flexibility to accommodate additional equipment as your requirements increase
3. Implement the new floor plan, leaving empty space where the array will be installed. If the new floorplan requires construction changes, consult with local contractors and your HP representatives.

## Floor clearance

The total floor clearance required for the disk array includes:

- The actual space required by the equipment.
- Service clearance — the floor space required to access the disk array. Never use this space for storage.
- Additional space required to properly distribute the equipment weight on your computer room's raised floor. The amount of additional space required depends on your floor load rating.

To determine the floor clearance required for your disk array configuration:

1. Refer to the appropriate diagram for your array configuration:
  - DKC only—Figure 4 ([page 36](#))
  - DKC with one DKU—Figure 5 ([page 38](#))
  - DKC with two DKUs—Figure 6 ([page 40](#))
  - DKC with three DKUs—Figure 7 ([page 42](#))
  - DKC with four DKUs—Figure 8 ([page 44](#))

2. In the floor clearance diagram:

- Clearance “A” is the space between the service clearance at the left side of the array (10 cm for the kickplate) and any other object, such as a desk or wall.
- Clearance “B” is the space between the service clearance at the right side of the array (10 cm for the kickplate) and any other object.
- Clearance “C” is the space between the service clearance at the front of the array and any other object.

You use the value of C and your floor load rating to determine the values for A and B.

3. Determine how much space you can assign to clearance C. For maintenance purposes, try to make C larger (100 cm) rather than smaller (0 cm). The smaller C is, the larger A and B must be.
4. In the table after the diagram, find the column for C. If your C value is in between two table values, use the larger table value. Then, find the row for your floor load rating. Where the column and row intersect is the A+B value.
5. To determine clearance A and clearance B, divide the A+B value between A and B. They do not need to be equal. For example, if the A+B value from the table is 60 cm, then A can be 40 cm and B can be 20, or both A and B can be 30. However, if your configuration includes only a DKC, or a DKC and one DKU, then A must be at least 28 cm (11.1 in) to allow for opening the DKC front door.

6. Calculate the floor clearance for the array:

Table 7. Calculating floor clearance

|                           | Left                 | Right                | Front                | Back            |
|---------------------------|----------------------|----------------------|----------------------|-----------------|
| Clearance values          | A = _____<br>+       | B = _____<br>+       | C = _____<br>+       | Not applicable  |
| Minimum service clearance | 10 cm (3.94 in)<br>= | 10 cm (3.94 in)<br>= | 80 cm (31.5 in)<br>= | 80 cm (31.5 in) |
| Minimum floor clearance   |                      |                      |                      | 80 cm (31.5 in) |

## Floor clearance — DKC only

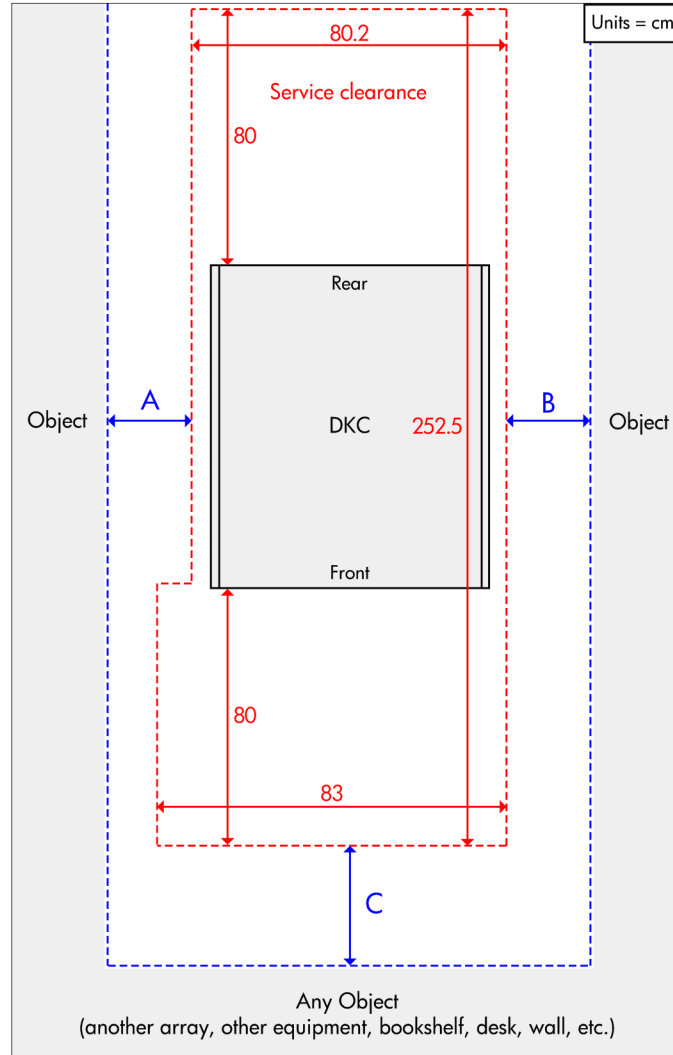


Figure 4. Floor clearance — DKC only

For an explanation of this diagram, see step 2 (page 34).

Table 8. A+B based on C and floor load rating — DKC only

| <b>Floor load rating<br/>(kg/m<sup>2</sup>)</b> | <b>C=0,<br/>A+B must =</b> | <b>C=20cm(7.9in),<br/>A+B must =</b> | <b>C=40cm(15.8in),<br/>A+B must =</b> | <b>C=60cm(23.6in),<br/>A+B must =</b> | <b>C=100cm(39.4in),<br/>A+B must =</b> |
|---|----------------------------|--------------------------------------|---------------------------------------|---------------------------------------|--|
| 500   | 40                         | 30                                   | 20                                    | 0                                     | 0                                      |
| 450   | 50                         | 40                                   | 30                                    | 20                                    | 0                                      |
| 400   | 80                         | 60                                   | 50                                    | 40                                    | 20                                     |
| 350   | 110                        | 90                                   | 80                                    | 60                                    | 40                                     |
| 300   | 170                        | 140                                  | 120                                   | 100                                   | 80                                     |

## Floor clearance — DKC and one DKU

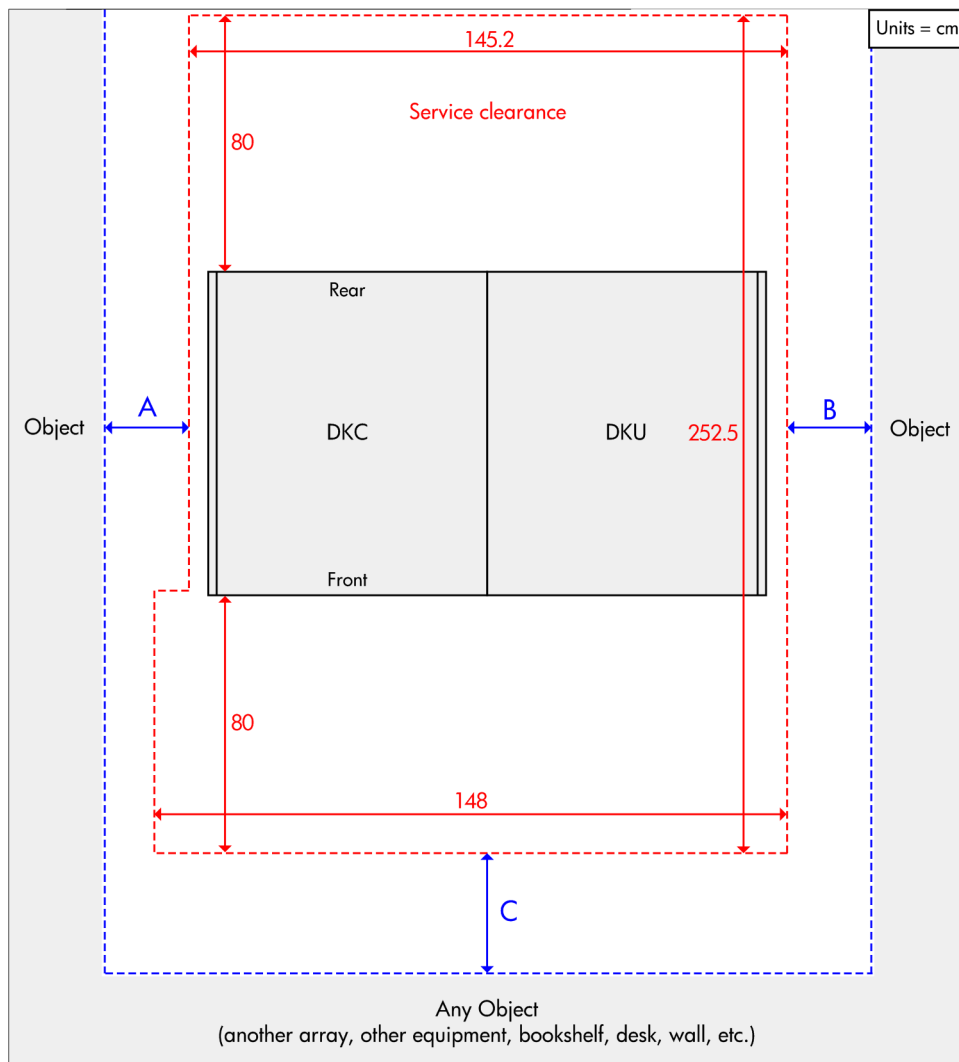


Figure 5. Floor clearance — DKC and one DKU

For an explanation of this diagram, see step 2 (page 34).

Table 9. A+B based on C and floor load rating — DKC and one DKU

| <b>Floor load rating (kg/m<sup>2</sup>)</b> | <b>C=0, A+B must =</b> | <b>C=20cm(7.9in), A+B must =</b> | <b>C=40cm(15.8in), A+B must =</b> | <b>C=60cm(23.6in), A+B must =</b> | <b>C=100cm(39.4in), A+B must =</b> |
|---|------------------------|----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| 500   | 80                     | 60                               | 40                                | 20                                | 0                                  |
| 450   | 110                    | 90                               | 70                                | 50                                | 20                                 |
| 400   | 160                    | 130                              | 100                               | 80                                | 50                                 |
| 350   | 230                    | 190                              | 160                               | 130                               | 90                                 |
| 300   | 330                    | 280                              | 240                               | 210                               | 160                                |

## Floor clearance — DKC and two DKUs

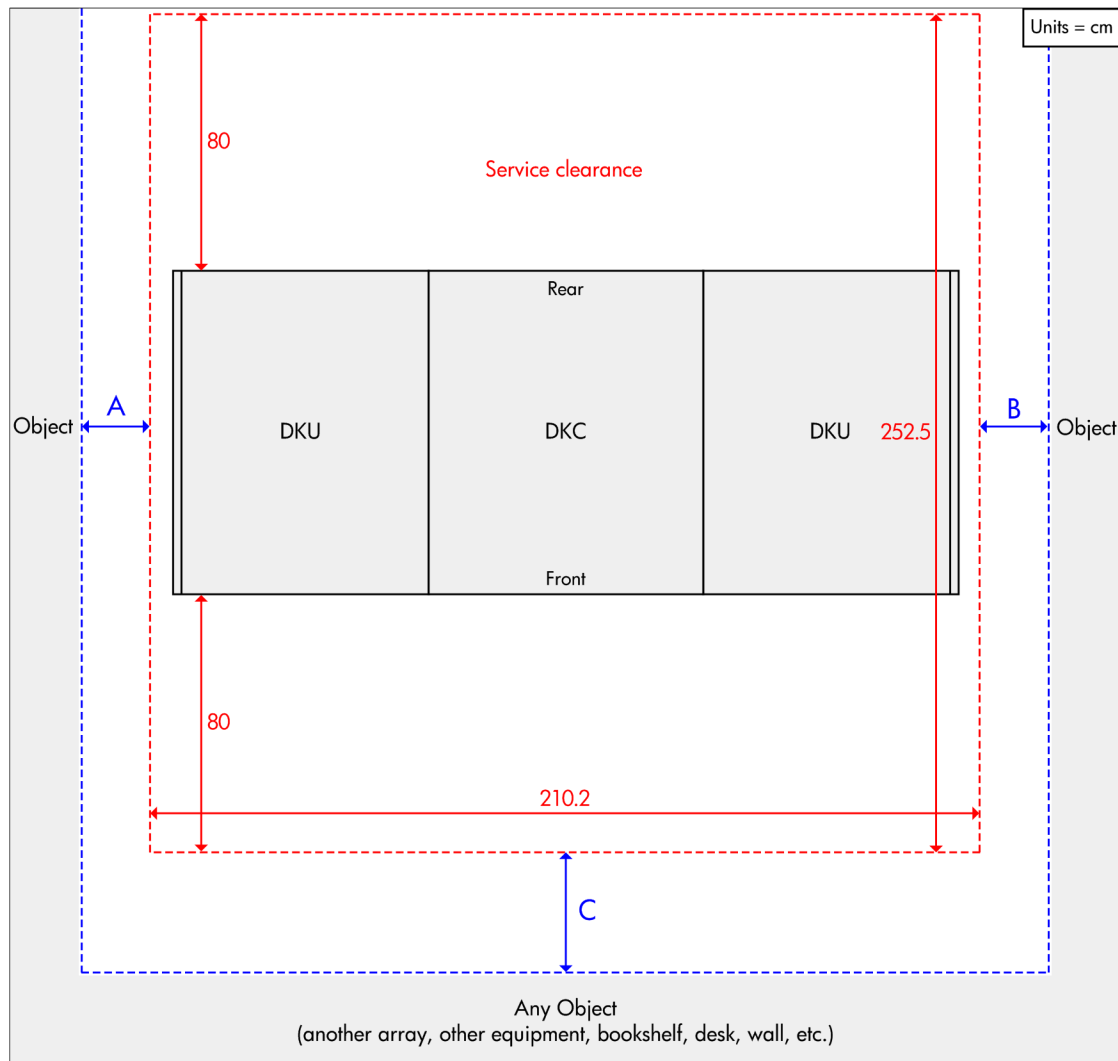


Figure 6. Floor clearance — DKC and two DKUs

For an explanation of this diagram, see [step 2 \(page 34\)](#).



Table 10. A+B based on C and floor load rating — DKC and two DKU

| <b>Floor load rating (kg/m<sup>2</sup>)</b> | <b>C=0, A+B must =</b> | <b>C=20cm(7.9in), A+B must =</b> | <b>C=40cm(15.8in), A+B must =</b> | <b>C=60cm(23.6in), A+B must =</b> | <b>C=100cm(39.4in), A+B must =</b> |
|---|------------------------|----------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| 500   | 120                    | 90                               | 60                                | 40                                | 0                                  |
| 450   | 170                    | 130                              | 100                               | 70                                | 30                                 |
| 400   | 240                    | 200                              | 160                               | 130                               | 80                                 |
| 350   | 340                    | 280                              | 240                               | 200                               | 140                                |
| 300   | 500                    | 430                              | 370                               | 320                               | 240                                |

## Floor clearance — DKC and three DKUs

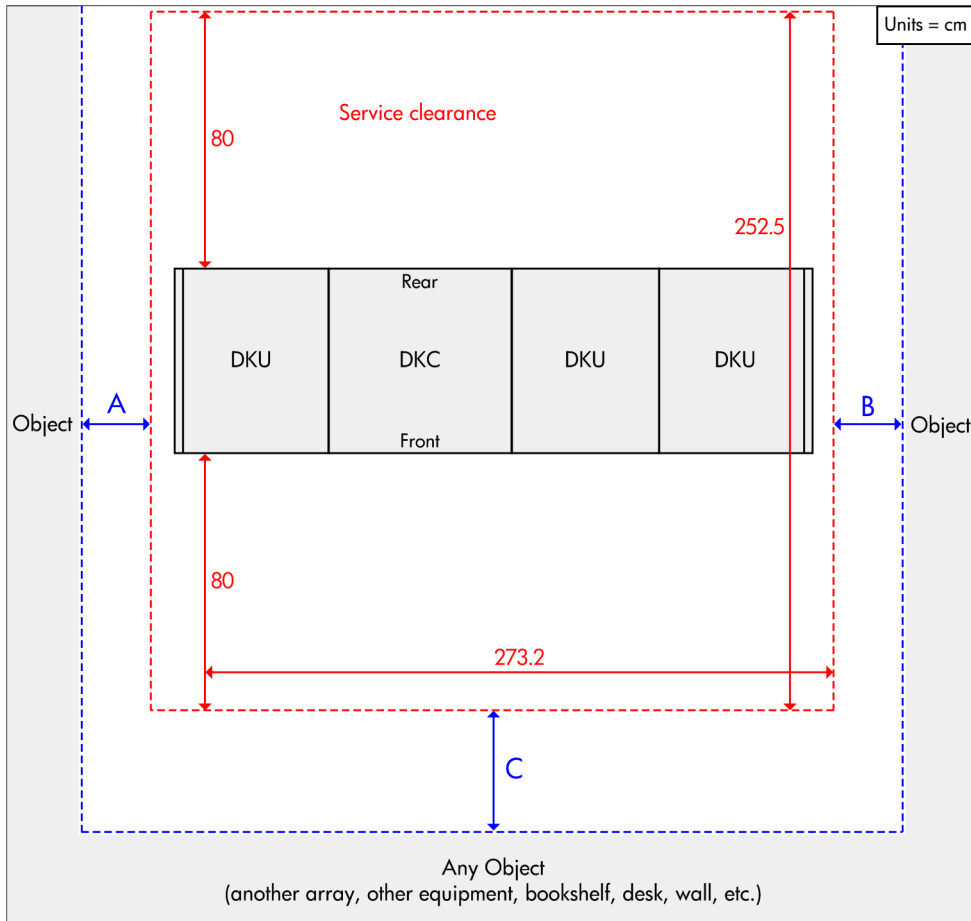


Figure 7. Floor clearance — DKC and three DKUs

For an explanation of this diagram, see [step 2 \(page 34\)](#).

Table 11. A+B based on C and floor load rating — DKC and three DKUs

| <b>Floor load rating<br/>(kg/m<sup>2</sup>)</b> | <b>C=0,<br/>A+B must =</b> | <b>C=20cm(7.9in),<br/>A+B must =</b> | <b>C=40cm(15.8in),<br/>A+B must =</b> | <b>C=60cm(23.6in),<br/>A+B must =</b> | <b>C=100cm(39.4in),<br/>A+B must =</b> |
|---|----------------------------|--------------------------------------|---------------------------------------|---------------------------------------|--|
| 500   | 160                        | 120                                  | 80                                    | 50                                    | 0                                      |
| 450   | 230                        | 180                                  | 140                                   | 100                                   | 50                                     |
| 400   | 320                        | 260                                  | 210                                   | 170                                   | 100                                    |
| 350   | 460                        | 380                                  | 320                                   | 270                                   | 190                                    |
| 300   | 660                        | 570                                  | 490                                   | 420                                   | 320                                    |

## Floor clearance — DKC and four DKUs

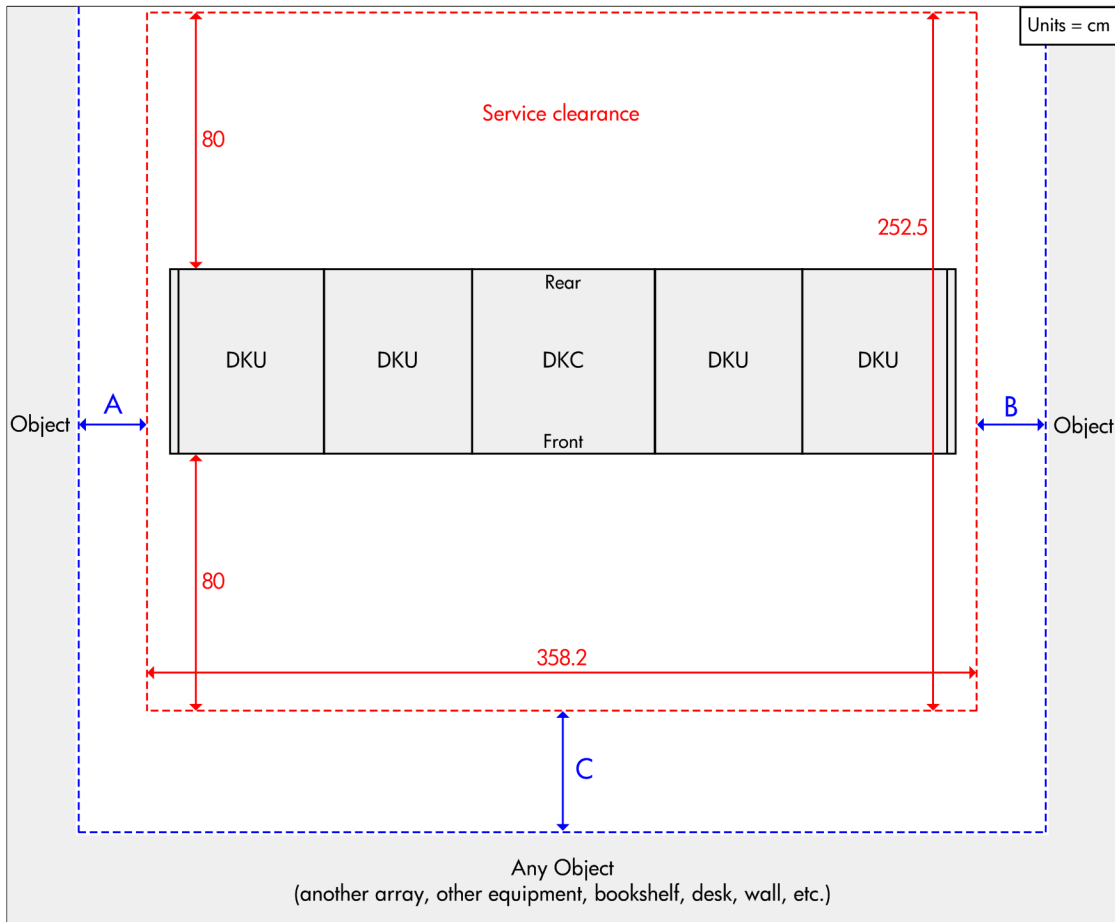


Figure 8. Floor clearance — DKC and four DKUs

For an explanation of this diagram, see step 2 (page 34).

Table 12. A+B based on C and floor load rating — DKC and four DKUs

| <b>Floor load rating<br/>(kg/m<sup>2</sup>)</b> | <b>C=0,<br/>A+B must =</b> | <b>C=20cm(7.9in),<br/>A+B must =</b> | <b>C=40cm(15.8in),<br/>A+B must =</b> | <b>C=60cm(23.6in),<br/>A+B must =</b> | <b>C=100cm(39.4in),<br/>A+B must =</b> |
|---|----------------------------|--------------------------------------|---------------------------------------|---------------------------------------|--|
| 500   | 200                        | 150                                  | 100                                   | 70                                    | 0                                      |
| 450   | 290                        | 230                                  | 170                                   | 130                                   | 60                                     |
| 400   | 410                        | 330                                  | 270                                   | 210                                   | 130                                    |
| 350   | 570                        | 480                                  | 400                                   | 340                                   | 240                                    |
| 300   | 830                        | 710                                  | 610                                   | 530                                   | 400                                    |

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## Environmental requirements

The environmental specifications for operating your disk array must be satisfied before installation.

### Altitude

The maximum altitude for disk array operation is 3,000 meters. For nonoperational or storage situations, the maximum altitude is 4,000 meters.

### Air conditioning

Use separate computer room air conditioning duct work. If it is not separate from the rest of the building, it might be difficult to control cooling and air pressure levels. Duct work seals are important for maintaining a balanced air conditioning system and high static air pressure. Adequate cooling capacity means little if humidity levels increase when the ducts are exposed to warm air, producing condensation. Condensation on any disk hardware can damage the components.

Any questions regarding the adequacy of airflow construction should be referred to and evaluated by a qualified structural engineer.

## Temperature

Table 13. Temperature specifications

| Temperature range type  | Range                             |
|---|-----------------------------------|
| Recommended operating temperature range                                 | 21° to 24° C<br>70° to 75° F      |
| Operating temperature   | 16° to 32° C<br>61° to 89° F      |
| Nonoperating temperature range  | –10° to +43° C<br>14° to 109° F   |
| Shipping and storage temperature<br>(product packed in factory packing) | –25° to +60° C<br>–13° to +140° F |
| Temperature shock immunity<br>(maximum rate of temperature change)      | 10° C per hour<br>18° F per hour  |
| Over-temperature warning  | At 40° C<br>At 104° F             |
| Over-temperature shutdown   | At 60° C<br>At 140° F             |

## Humidity

Maintain proper humidity levels. High humidity levels cause galvanic actions to occur between some dissimilar metals. This eventually causes a high resistance between connections, leading to equipment failure.

Low humidity contributes to undesirably high levels of electrostatic charges. This increases the electrostatic discharge (ESD) voltage potential. ESD can cause component damage during servicing operations.

Low humidity levels are often the result of the facility heating system and occur during the cold season. Most heating systems provide air with a low humidity level, unless the system has a built-in humidifier.

You should not see any condensation in or around the disk array under any conditions. There is no procedure for recovery from moisture condensation.

Table 14. Humidity specifications

| Humidity range type   | Noncondensing relative humidity (RH) |
|---|--------------------------------------|
| Recommended operating humidity range at 22° C (71° F)                   | 50% to 55%                           |
| Operating humidity range at 22° C (71° F)                               | 20% to 80%                           |
| Nonoperating humidity range   | 8% to 90%                            |
| Shipping and storage humidity range (product packed in factory packing) | 5% to 95%                            |
| Operating maximum wet bulb temperature                                  | 26° C (79° F)                        |
| Nonoperating maximum wet bulb temperature                               | 27° C (81° F)                        |
| Shipping and storage maximum wet bulb temperature                       | 29° C (84° F)                        |

## Mechanical vibration

Continuous vibration can cause a slow degradation of mechanical parts and, when severe, can cause data errors in disk drives. Mechanical connections such as printed circuit assembly (PCA) conductors, cable connectors, and processor backplane wiring can also be affected by vibrations. Vibration specifications apply to all three axes.

Table 15. Mechanical vibration specifications

| Condition  | Specification   |
|--|---|
| Operating  | 0.25 mm, 5–10 Hz<br>0.05 G, 10–300 Hz                                       |
| Nonoperating   | 2.5 mm, 5–10 Hz<br>0.5 G, 10–70 Hz<br>0.05 mm, 70–99 Hz<br>1.0 G, 99–300 Hz |
| Shipping and storage (product packed in factory packing) | 0.5 G, 15 min. <sup>1</sup> at four most severe resonances between 5–200 Hz |

<sup>1</sup> See ASTM D999-91 Standard Methods for Vibration Testing of Shipping Containers.



## Shock

Table 16. Shock specifications

| Condition  | Specification  |
|--|--|
| Operating  | None   |
| Nonoperating   | 8 G, 15 ms   |
| Shipping and storage (product packed in factory packing) | Horizontal: <sup>1</sup><br>Incline impact: 1.22 m/s<br><br>Vertical: <sup>2</sup><br>Rotational edge: 0.1 m |

- 1 See ASTM D5277-92 Standard Test Methods for Performing Programmed Horizontal Impacts Using an Inclined Impact Tester.
- 2 See ASTM D1083-91 Standard Test Methods for Mechanical Handling of Unitized Loads and Large Shipping Cases and Crates.

## Heat dissipation and power consumption

Table 17 describes the heat dissipation and power consumption of the XP12000 when fully loaded with the maximum number of disk drives.

Table 17. Heat dissipation and power consumption specifications

| Parameter               | DKC   | EachDKU | Full array<br>(1 DKC and 4 DKUs) |
|-------------------------|-------|---------|----------------------------------|
| Power consumption (kVA) | 8.45  | 7.50    | 38.45                            |
| Heat dissipation (kW)   | 8.02  | 6.75    | 35.02                            |
| BTUs per hour           | 27370 | 23036   | 119514                           |
| kcal per hour           | 6897  | 5805    | 30117                            |

## Acoustics

The acoustic emission specifications for the disk array are:

- 8.27 Bels (A) sound power
- 65 dB (A) sound pressure, operator position (1 meter from the floor and surface of the cabinet)

You can reduce the ambient noise level caused by equipment and air conditioning blowers in your computer room by:

- Installing a dropped ceiling covered in commercial-grade, fire-resistant, acoustic-rated, fiberglass ceiling tile
- Covering the walls in sound-deadening material
- Installing foam rubber removable partitions

## Dust and pollution control

Airborne contaminants and particles of a certain size and hardness can damage the disk array. Some of the most common contaminants are dust, smoke, ash, eraser debris, food crumbs, and salty air.

Mechanical filters on the disk array protect it by trapping large dust particles. Smaller particles can pass through some filters, and can eventually cause problems in mechanical parts. Prevent small dust particles from entering the computer room by maintaining its air conditioning system at a high static air pressure level.

Your HP representative can help you determine if you need to be concerned about airborne contaminants.

## Metallic particulate contamination

Metallic particulates can be especially harmful around electronic equipment. This type of contamination may enter the data center environment from a variety of sources, including but not limited to raised floor tiles, worn air conditioning parts, heating ducts, rotor brushes in

vacuum cleaners, or printer component wear. Because metallic particulates conduct electricity, they have an increased potential for creating short circuits in electronic equipment.

Over time, very fine whiskers of pure metal can form on electroplated zinc, cadmium, or tin surfaces. If these whiskers are disturbed, they may break off and become airborne, possibly causing failures or operational interruptions. For over 50 years, the electronics industry has been aware of the relatively rare but possible threat posed by metallic particulate contamination. During recent years, a growing concern has developed in computer rooms where these conductive contaminants are formed on the bottom of some raised floor tiles.

Although this problem is relatively rare, it may be an issue within your computer room. Since metallic contamination can cause permanent or intermittent failures on your electronic equipment, HP strongly recommends that your site be evaluated for metallic particulate contamination before installation of electronic equipment.

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## Data comm requirements

Route data comm cables away from areas of high static electric fields created by power transformers and heavy foot traffic. Use shielded data comm cables that meet approved industrial standards to reduce the effects of external fields.

For the XP disk array, you need:

Table 18. Computer room data comm requirements

| Item   | Description   |
|--|---|
| A dedicated analog phone line  | Needed for the HP StorageWorks Continuous Track XP “phone home” feature, if you plan to use it. An HP representative will configure Continuous Track XP during installation. For more information on Continuous Track XP, see the <i>HP StorageWorks XP12000 Disk Array Owner’s Guide</i> . |
| A twisted pair (Cat 5) cable<br>An available LAN drop on your Intranet | Needed to connect the XP12000 to an available Ethernet port on your public LAN. To ensure network security, consult with an HP representative and your network administrator before selecting the appropriate location of your LAN drop.  |
| A public voice phone line near the disk array                          | Needed to allow your staff and HP representatives to communicate inside and outside your site.  |

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# Electrical requirements

## Line voltage

Line voltage (AC) at the wall power outlet is a function of the local power utility and your building power distribution network. Voltages outside of the operating range of the disk array can cause intermittent system errors or a complete system shutdown. If required, an HP representative and your electrician can determine the current line voltage and make recommendations. See [Appendix A](#) for specific AC line voltage requirements.

Avoid the use of a line voltage conditioner.

Make sure that a power distribution unit (if used) provides the correct voltage to support your entire system.

## Branch circuit breakers

See [Appendix A](#) for specific branch circuit requirements for your power situation.

### Three-phase branch circuit breakers

The power cords supplied with each DKC or DKU configured for three-phase power are sized for connection to a 30-amp circuit.

### Single-phase branch circuit breakers

The power cords supplied with each DKC or DKU configured for single-phase power are sized for connection to a 30- or 50-amp circuit.

*Note* 30-amp, single-phase power is available by special order only.

## Frequency

Usually, AC line frequency is determined by your local power providers. In some cases, electrical power is supplied by motor-generators. Shifts in AC line frequency can cause system errors. An HP representative can monitor the frequency of the input AC line power and make recommendations, if necessary. The disk array requires that the line frequency be within 0.5 Hz of the rated line frequency (50 Hz or 60 Hz).

See [Appendix A](#) for more information.

## Safety and dedicated ground

The primary reason for grounding electrical systems is safety. The safety ground is required by the National Electric Code (USA) and most other local, regional, and national codes. In addition to safety ground, HP requires that a dedicated (earth reference) ground be installed as a common reference point for all system components. Consult with an HP representative and your electrician to ensure that your electrical system meets all local and national safety codes.

## Grounding requirements

Your site's electrical subsystem must meet all of the following conditions:

- Grounding as prescribed by your local country codes.
- An insulated grounding conductor that is identical in size and insulation material and thickness to the ungrounded branch-circuit supply conductors. It should be green, with or without yellow stripes, and is to be installed as a part of the branch circuit that supplies the unit or system. This means the ground conductor must be run in the same conduit, armored cable, or other cable bundle as the phase wires.
- The grounding conductor should be grounded to earth at the service equipment or other acceptable building earth ground such as the building frames (in case of a high-rise steel-frame structure).
- IT-configured grounding systems are not certified for use with the disk array as these grounding systems may not have solidly

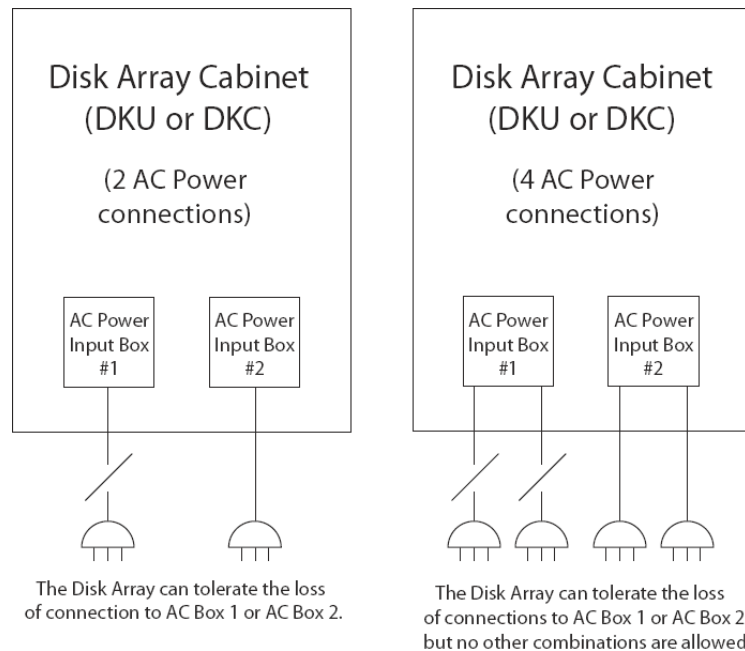
conductor-connected grounded power systems and/or they may have resistive impedance inserted in ground and/or neutral lines. The disk array requires a solidly conductor-connected ground and may require a separate neutral in the case of WYE or STAR connections. For HP disk arrays, TN grounding systems are preferred.

## Receptacles

Each disk array cabinet has two or four separate connections to AC power.

- For disk array cabinets with two connections to AC power, each input must be capable of supporting the entire current demand for the cabinet.
- For disk array cabinets with four connections to AC power, the two inputs to AC Box 1 or the two inputs to AC Box 2 must be capable of supporting the entire current demand for the cabinet.

Figure 9 shows two examples of the fault-tolerant operation of the disk array.



*Figure 9. Examples of fault-tolerant power connections*

When receptacles are used to connect disk array components to AC power, they must include a dedicated ground connection that is insulated from the receptacle. It is important that the receptacle box be grounded with an additional ground connection that is separate from the dedicated ground. The additional ground can be hard conduit.

Specific power plugs and receptacles are required for the DKC and DKUs depending on the power option you specify when ordering the HP XP12000 disk array. The power cords on 60 Hz cabinets are shipped with plugs attached and connected. The power cords on 50 Hz cabinets are shipped without plugs. You are responsible for having the correct plugs and receptacles installed by an electrician in compliance with local electrical requirements and practices.

---

**Caution** *When installing the receptacles, the electrician must ensure that each receptacle has its own neutral (if required) and ground. Using the same neutral/ground for more than one circuit causes voltage loss and heat problems and can create a fire hazard. A shared neutral conductor that fails open-circuit can cause overvoltage damage to equipment.*

---

See [Appendix A](#) for specific plug and receptacle part numbers and ordering information.

## Power line transients

Heavy electrical loads from nearby machinery or equipment (for example, elevators or electric welders) can cause intermittent system problems with sophisticated electronic equipment, even if that equipment is on a separate circuit breaker. When faced with these conditions, provide a separate, completely independent power panel with an isolated ground and circuit breaker coming directly from the main building power source or secondary power source.

If necessary, an HP representative can measure your power line noise level and make appropriate recommendations concerning the use of line treatment devices.



## Maximum peak inrush and crest factor

Table 19. Maximum peak inrush

| Cabinet | Power  | Single-phase | Three-phase                 |
|---------|--------|--------------|-----------------------------|
| DKC     | 30-amp | 46 A         | 34 A                        |
|         | 50-amp | 60 A         | Not applicable <sup>1</sup> |
| DKU     | 30-amp | 34 A         | 26 A                        |
|         | 50-amp | 56 A         | Not applicable <sup>1</sup> |

<sup>1</sup> 50-amp power configurations are single-phase only.

Table 20. Crest factors

| Cabinet | Power  | Single-phase | Three-phase                 |
|---------|--------|--------------|-----------------------------|
| DKC     | 30-amp | 1.68         | 1.67                        |
|         | 50-amp | 1.56         | Not applicable <sup>1</sup> |
| DKU     | 30-amp | 1.65         | 1.53                        |
|         | 50-amp | 1.50         | Not applicable <sup>1</sup> |

<sup>1</sup> 50-amp power configurations are single-phase only.

# Uninterruptible power supply (UPS)

Most disk array units are installed in data centers where a UPS strategy is already in place. However, if you are making your first large disk array purchase, you may need a separate UPS solution.

Caution

This section discusses a product UPS. If you are planning or already have a site-wide UPS, HP recommends against using a product UPS powered by a site-wide UPS for the XP12000.

Make sure your UPS satisfies the requirements in [Table 21](#). Table values are based on a worst-case voltage (rated voltage –10 percent) and a maximum configuration of DKC/DKUs. A phase imbalance of 15 percent is also included in the calculation.

Table 21. Single secondary input (primary offline) power requirements

| Input(Vac) | Single-phase 30A |                     | Single-phase 50A |                     | Three-phase 30A     |
|------------|------------------|---------------------|------------------|---------------------|---------------------|
|            | DKC              | Each additional DKU | DKC              | Each additional DKU | Each additional DKU |
| 208        | 20.0 A           | 17.3 A              | 40.0 A           | 34.6 A              | 20.0 A              |
| 400        | Not applicable   | Not applicable      | Not applicable   | Not applicable      | 10.4 A              |

In a maximum disk array configuration (one DKC and four DKUs), the array requires 31 kVA.

## Sources of electrical interference

Ensure that the disk array is protected from sources of electrical interference:

*Table 22. Sources of electrical interference*

| Potential source             | Description   |
|------------------------------|---|
| Wall outlets                 | <p>Convenience power outlets for building maintenance equipment (such as vacuum cleaners and floor buffers) must be wired from circuit breakers on a power panel separate from the computer system panel. The ground wires from these outlets must be connected to the normal building distribution panel and not to the system ground.</p> <p>If a separate power source and separate ground are not provided, operation of janitorial equipment can induce electrical noise and cause abnormal operation of the computer system. Your electrician can verify whether or not maintenance outlets are on separate panels.</p> |
| Lightning                    | <p>In geographical areas subject to lightning storms, it may be advisable to install lightning protection for both personnel and computer systems. The principles of lightning protection and personnel safety are outlined in detail in the lightning protection code contained in the National Fire Protection Association (NFPA) Handbook.</p>   |
| Electromagnetic interference | <p>The disk array is specifically designed to reduce its susceptibility to radiated and conducted interference. Electromagnetic interference can cause a variety of system problems. An HP representative can advise you about the most common causes of electromagnetic interference.</p>  |

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## Delivery space requirements

The delivery area must provide enough space and floor strength to support the packaged equipment cartons for the disk array. Refer to the packaged dimensions in “Dimensions” ([page 19](#)) and the packaged weights in “Weights” ([page 19](#)).

---

**Caution** *Make sure that your doorways and hallways provide enough clearance to move the equipment safely from the delivery area to the computer room. Permanent obstructions such as pillars or narrow doorways can cause equipment damage. If necessary, plan for the removal of walls or doors.*

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**Caution** *Make sure all floors, stairs, and elevators you use when moving the disk array to the computer room can support the weight and size of the equipment. Failure to do so could damage the equipment or your site.*

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## Delivery and Unpacking

The disk array equipment is shipped directly from HP. If the disk array is part of a system order, HP coordinates shipment from all HP locations so that all of the equipment arrives at your site at approximately the same time.

When your equipment ships, HP provides you with carrier information and an expected delivery date. Factors beyond HP's control can cause delivery delays. If you have not received your equipment within two weeks of its shipment from HP, contact your HP SR, who will trace your order and expedite delivery.

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**Caution** *Before delivery, make sure your site meets “Delivery space requirements” (page 60).*

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## Checking for shipping shortage and damage

Upon delivery of each equipment shipment:

1. Check the carrier's bill of lading to ensure that the items listed match the items delivered. Notify the carrier immediately if there are any discrepancies or missing items.
2. Inspect all shipping containers for signs of damage, such as dents, scratches, cuts, or water marks.
3. If you see any damage to the containers:
  - a. Note on the bill of lading that there is apparent damage, subject to inspection.
  - b. Arrange for the carrier's representative and an HP representative to be present when the item in question is unpacked.
  - c. Contact your HP representative, who will make sure any damaged components are replaced, regardless of the circumstances and without waiting for any claim settlements.

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# Unpacking the equipment

HP representatives will supervise the unpacking and moving of the disk array equipment. It is your responsibility to provide the people, tools, and equipment necessary to perform these tasks.

## Packaging configurations

XP disk array cabinets are shipped in one of three standard packaging configurations:

- Environmental pack — consists of stretch wrap over corner protectors. No special tools or procedures are required to unpack shipments in this form. This packaging is used for most shipments within the USA and Canada that are direct from the factory to the customer. HP uses special carriers with a dedicated fleet of trucks and specially trained personnel.
- Full packaging — consists of a pallet, wooden loading ramp, inner packaging, and outer corrugated carton assembly.
- Full packaging with wooden crate — consists of full packaging encased in a wooden crate.

## Required personnel

HP recommends that three physically able personnel be available to assist with off-loading the disk array equipment from the pallet. Personnel must be knowledgeable and experienced with the safe handling of large, heavy, and sensitive computer equipment.

## Required tools

- Claw hammer (if full packaging with wooden crate)
- Ratchet wrench or box-open end wrench sizes 11mm (7/16") and 19mm (3/4"), or adjustable end wrench
- 6mm hex wrench

- Scissors or box knife to cut polyester banding
- Safety glasses
- Short stepladder (helpful, but not required)

## Unpacking process

If you need to unpack the equipment without HP supervision, follow the instructions in this section.

1. Following the steps “Removing packaging materials” ([page 66](#)), unpack the DKC and DKU equipment cartons outside of the computer room to avoid debris and possible contamination of the computer room environment.
2. For software CDs, cables, and other installation hardware, leave the sealed cartons or packages intact. HP representatives will unpack them when they install and configure the disk array.
3. As you unpack the cartons, match the delivered items to the packing list (invoice) for each carton. Contact your HP SR immediately if any items are missing or are not the ones you ordered.
4. Move all equipment to the computer room before the installation date.

## Safety precautions

**Caution** *Be very careful when handling the equipment. Do not drop the equipment from a height of more than 0.5 cm (0.2 in). Floor unevenness must be less than 1 cm (0.4 in).*



### Warning

**The DKC and DKU are very heavy.** To avoid injury, use appropriate lifting tools and have three people unpack and move the equipment.



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**Caution** *Any movement of the equipment by forklift should be done prior to unpacking. The carton assembly provides the most secure support of the equipment during movement. Transporting the equipment by forklift after the packaging carton has been removed is not advisable.*

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**Caution** *DKCs and DKUs are top heavy and contain very sensitive electronic and mechanical components. When moving on frame casters, the rolling surface must be able to support the equipment weight and must be free of surface conditions that could cause shock or vibration to the cabinet contents.*

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**Warning**

When using sharp objects or cutting tools, make sure that no part of your body lies in the path of the blade bit or point.

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**Caution** *When detached from each other, DKCs and DKUs do not have side panels. Exposed printed circuit boards (PCB) are present; however, normal handling of the cabinet by the metal frames does not pose any ESD risks.*

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**Caution** *When disk array equipment is not located in a data center or computer room, it must be stored in a controlled area that meets environmental requirements ([page 46](#)).*

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## Removing packaging materials

Unpack the DKC first. DKC packaging contains a wooden ramp; standard DKU packaging does not<sup>1</sup>. You will use the ramp to unload both the DKC and DKUs.

1. If shipped in a wooden crate:
  - a. Using an 11mm (7/16") ratchet or wrench, remove the six lag screws at the base of crate.
  - b. Using the claw end of a claw hammer, remove the crate clamps.



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### Warning

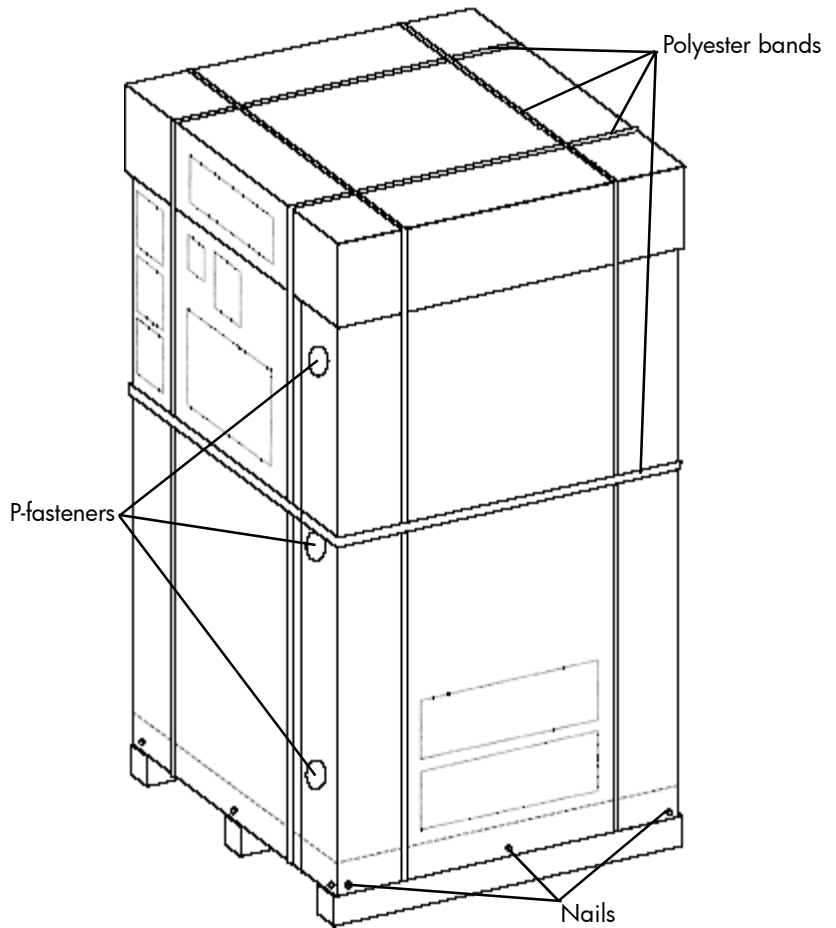
Crate clamps are under tension. Wear safety glasses and hold onto the clamp with your free hand during removal.

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- c. Remove the crate panels.

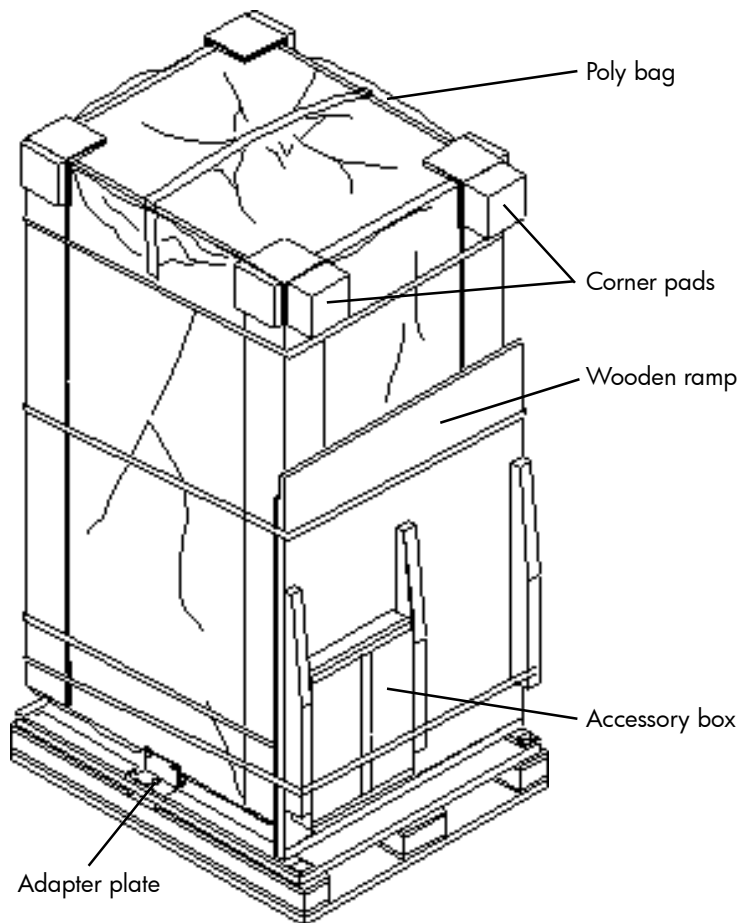
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<sup>1</sup> DKUs shipped as upgrades (without a DKC) will contain a ramp.



*Figure 10. Typical full frame outer packaging*

2. Cut and remove the polyester bands.
3. Remove the nails attaching the carton to the pallet.
4. Remove the plastic carton fasteners (p-fasteners).
5. Remove the carton.



*Figure 11. Typical full frame inner packaging with ramp*

6. Remove the accessory boxes, ramp, and corner pads.
7. Using a 6mm hex and 19mm wrench, remove the adapter plates that anchor the cabinet to the pallet.
8. Remove the poly bag covering the cabinet.
9. **Following the instructions provided on the wooden ramp**, attach the ramp to the pallet and roll the cabinet onto the floor.
10. Visually check the unit for any damage.

# A

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## Electrical Specifications

The detailed electrical specifications in this appendix are provided to help your site electrician perform any necessary electrical work related to site prep.

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## AC line voltage requirements

### 50-amp, single-phase DKC

Table 23. 50-amp, 50 or 60 Hz, single-phase DKC operation

| Parameter   | Nominal rated voltage (Vac) |                  |      |      |      |
|---|-----------------------------|------------------|------|------|------|
|   | 200                         | 208 <sup>1</sup> | 220  | 230  | 240  |
| Minimum operating voltage (Vac)                         | 184                         | 191              | 202  | 212  | 221  |
| Maximum operating voltage (Vac)                         | 212                         | 220              | 233  | 244  | 254  |
| Rated line current per power cord (Arms)                | 22.6                        | 21.7             | 20.5 | 19.6 | 18.8 |
| Number of power cords                                   | 2                           | 2                | 2    | 2    | 2    |
| Recommended circuit breakers                            | 50A                         | 50A              | 50A  | 50A  | 50A  |
| Number of circuit breakers                              | 2                           | 2                | 2    | 2    | 2    |
| Dropout carry-through time at minimum line voltage (ms) | 60                          | 60               | 60   | 60   | 60   |

1 60 Hz only.

### 30-amp, single-phase DKC

Table 24. 30-amp, 50 or 60 Hz, single-phase DKC operation

| Parameter   | Nominal rated voltage (Vac) |                  |      |     |     |
|---|-----------------------------|------------------|------|-----|-----|
|   | 200                         | 208 <sup>1</sup> | 220  | 230 | 240 |
| Minimum operating voltage (Vac)                         | 184                         | 191              | 202  | 212 | 221 |
| Maximum operating voltage (Vac)                         | 212                         | 220              | 233  | 244 | 254 |
| Rated line current per power cord (Arms)                | 11.3                        | 10.9             | 10.3 | 9.8 | 9.4 |
| Number of power cords <sup>2</sup>                      | 4                           | 4                | 4    | 4   | 4   |
| Recommended circuit breakers                            | 30A                         | 30A              | 30A  | 30A | 30A |
| Number of circuit breakers                              | 4                           | 4                | 4    | 4   | 4   |
| Dropout carry-through time at minimum line voltage (ms) | 60                          | 60               | 60   | 60  | 60  |

1 60 Hz only.

2 Units with only two power cords require only two circuit breakers.

## 30-amp, three-phase DKC

Table 25. 30-amp, 50 or 60 Hz, three-phase DKC operation

| Parameter   | Nominal rated voltage (Vac) |                  |      |      |      |     |     |     |
|---|-----------------------------|------------------|------|------|------|-----|-----|-----|
|   | 200                         | 208 <sup>1</sup> | 220  | 230  | 240  | 380 | 400 | 415 |
| Minimum operating voltage (Vac)                         | 184                         | 191              | 202  | 212  | 221  | 350 | 368 | 382 |
| Maximum operating voltage (Vac)                         | 212                         | 220              | 233  | 244  | 254  | 403 | 424 | 440 |
| Rated line current per power cord (Arms)                | 13                          | 12.5             | 11.9 | 11.3 | 10.9 | 6.9 | 6.5 | 6.3 |
| Number of power cords                                   | 2                           | 2                | 2    | 2    | 2    | 2   | 2   | 2   |
| Recommended circuit breakers                            | 30A                         | 30A              | 30A  | 30A  | 30A  | 30A | 30A | 30A |
| Number of circuit breakers                              | 2                           | 2                | 2    | 2    | 2    | 2   | 2   | 2   |
| Dropout carry-through time at minimum line voltage (ms) | 60                          | 60               | 60   | 60   | 60   | 60  | 60  | 60  |

1 60 Hz only.

## 50-amp, single-phase DKU

Table 26. 50-amp, 50 or 60 Hz, single-phase DKU operation

| Parameter   | Nominal rated voltage (Vac) |                  |      |      |      |
|---|-----------------------------|------------------|------|------|------|
|   | 200                         | 208 <sup>1</sup> | 220  | 230  | 240  |
| Minimum operating voltage (Vac)                         | 184                         | 191              | 202  | 212  | 221  |
| Maximum operating voltage (Vac)                         | 212                         | 220              | 233  | 244  | 254  |
| Rated line current per power cord (Arms)                | 18                          | 17.3             | 16.4 | 15.7 | 15.0 |
| Number of power cords                                   | 2                           | 2                | 2    | 2    | 2    |
| Recommended circuit breakers                            | 50A                         | 50A              | 50A  | 50A  | 50A  |
| Number of circuit breakers                              | 2                           | 2                | 2    | 2    | 2    |
| Dropout carry-through time at minimum line voltage (ms) | 60                          | 60               | 60   | 60   | 60   |

1 60 Hz only.

## 30-amp, single-phase DKU

Table 27. 30-amp, 50 or 60 Hz, single-phase DKU operation

| Parameter   | Nominal rated voltage (Vac) |                  |     |     |     |
|---|-----------------------------|------------------|-----|-----|-----|
|   | 200                         | 208 <sup>1</sup> | 220 | 230 | 240 |
| Minimum operating voltage (Vac)                         | 184                         | 191              | 202 | 212 | 221 |
| Maximum operating voltage (Vac)                         | 212                         | 220              | 233 | 244 | 254 |
| Rated line current per power cord (Arms)                | 9                           | 8.7              | 8.2 | 7.8 | 7.5 |
| Number of power cords                                   | 4                           | 4                | 4   | 4   | 4   |
| Recommended circuit breakers                            | 30A                         | 30A              | 30A | 30A | 30A |
| Number of circuit breakers <sup>2</sup>                 | 4                           | 4                | 4   | 4   | 4   |
| Dropout carry-through time at minimum line voltage (ms) | 60                          | 60               | 60  | 60  | 60  |

1 60 Hz only.

2 Units with only two power cords require only two circuit breakers.

## 30-amp, three-phase DKU

Table 28. 30-amp, 50 or 60 Hz, three-phase DKU operation

| Parameter   | Nominal rated voltage (Vac) |                  |     |     |     |     |     |     |
|---|-----------------------------|------------------|-----|-----|-----|-----|-----|-----|
|   | 200                         | 208 <sup>1</sup> | 220 | 230 | 240 | 380 | 400 | 415 |
| Minimum operating voltage (Vac)                         | 184                         | 191              | 202 | 212 | 221 | 350 | 368 | 382 |
| Maximum operating voltage (Vac)                         | 212                         | 220              | 233 | 244 | 254 | 403 | 424 | 440 |
| Rated line current per power cord (Arms)                | 10.4                        | 10.0             | 9.4 | 9.0 | 8.7 | 5.5 | 5.2 | 5.0 |
| Number of power cords                                   | 2                           | 2                | 2   | 2   | 2   | 2   | 2   | 2   |
| Recommended circuit breakers                            | 30A                         | 30A              | 30A | 30A | 30A | 30A | 30A | 30A |
| Number of circuit breakers                              | 2                           | 2                | 2   | 2   | 2   | 2   | 2   | 2   |
| Dropout carry-through time at minimum line voltage (ms) | 60                          | 60               | 60  | 60  | 60  | 60  | 60  | 60  |

1 60 Hz only.



---

## Receptacle part numbers and ordering information

Table 29 lists the plug and receptacle part numbers for 60 Hz configurations of the XP12000 disk array.

Table 29. 60 Hz power plugs and receptacles

| Power source | Breaker rating | Plug                 | Receptacle   |
|--------------|----------------|----------------------|--|
| Single-phase | 30 A           | Russellstoll 3750DP  | Russellstoll 3933 (alt. 9C33U0) or 3753 (alt. 9R33U0W) |
|              | 50 A           | Russellstoll 9P53U2  | Russellstoll 9C53U2 or 9R53U2W                         |
| Three-phase  | 30 A           | Russellstoll 3760PDG | Russellstoll 3934 (alt. 9C34U0) or 3754 (alt. 9R34U0W) |

Russellstoll connectors are available through most electrical distributors. HP has arranged for the distributors listed below to stock these connectors. These distributors are able to ship worldwide via your preferred carrier.

Beck Electrical Supply  
2775 Goodrick Avenue  
Richmond, CA 94801 USA  
Telephone: (800) 466-4395  
Fax: (800) 466-5442  
Contact: Ken Mogan  
[casales@beckelectric.com](mailto:casales@beckelectric.com)

Source Research, Inc. (SRI)  
2160 Sunnydale Boulevard  
Clearwater, FL 33765-2108 USA  
Telephone: (800) 356-0259  
Contact: Erik Peterson, telephone extension 302  
<http://www.sourceresearch.com/index.cfm>

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## Three-phase cabling for the USA (60 Hz)

Each three-phase DKU has two main disconnect devices (two main breakers for dual power lines) so that AC power to the unit can be supplied from separate power distribution panels with two power-supply cords.

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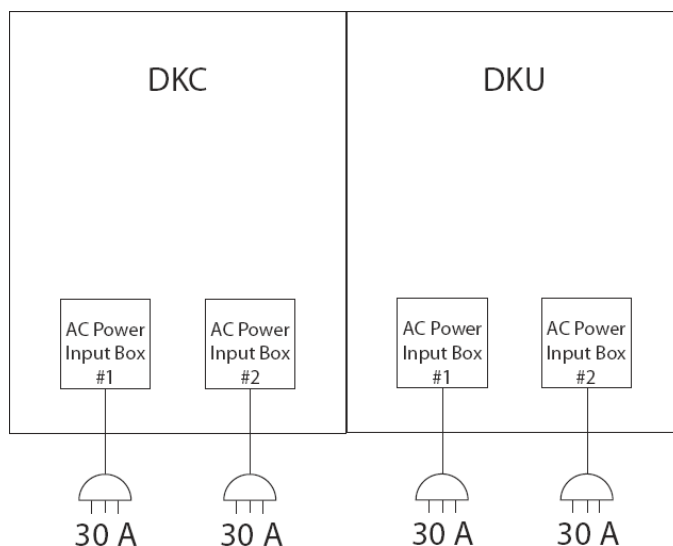
**Caution** *An HP representative should be present whenever the disk array is being connected to a new power source for the first time.*

---

### Connecting the external power-supply cords

The XP12000 disk array is factory-configured for 30-amp, three-phase power.

When the disk array uses 30-amp, three-phase input power, the DKC and DKUs have two power cords each.



*Figure 12. 30-amp, three-phase power cords*

If one power source malfunctions, the other power source assumes the total load, providing uninterrupted operation. HP recommends that each power

cord have a separate electrical circuit as its source, in case of a circuit failure. Each power-supply cord is supplied with an attachment plug type Russellstoll 3760PDG.

Be sure to install Russellstoll 3934 (alternate, 9C34U0) or 3754 (alternate, 39R34U0W) socket receptacles between the power distribution panel of the building and the power plugs for the unit.

The power cords provided with the disk array are nonshielded, type ST or equivalent with four #8 AWG (minimum) conductors terminated at one end with an assembled plug connector.

## **Branch circuit requirements**

To protect the disk array, your building must be wired correctly. Each supply (“hot”) conductor must be protected by a short-circuit protective device and by an overcurrent protective device. Table 25 ([page 71](#)) and Table 28 ([page 72](#)) provide specifications for the overcurrent protective devices required for three-phase operation.

All protective devices must comply with national standards of the country where the units are to be installed. If a protective device interrupts any supply conductor, it must also interrupt all other supply conductors.

Overcurrent protection is not required for the neutral conductor of this unit. Only 50 Hz, three-phase configurations have a neutral conductor.

# Three-phase AC cabling for Europe (50 Hz)

Each three-phase DKU has two main disconnect devices (two main breakers for dual power lines) so that AC power to the unit can be supplied from separate power distribution panels with two power-supply cords.

Caution

*An HP representative should be present whenever the disk array is being connected to a new power source for the first time.*

## Connecting the power-supply cords

All 50 Hz, European XP12000 disk array cabinets are shipped with unterminated power cords. Your electrician must select and install the correct power plug. Be sure to prepare the socket receptacles and power cords between the power distribution board of the building and the attachment plugs for the unit. 30-amp power cords of type H07RN-F or equivalent, with five 6 mm<sup>2</sup> conductors per cord, are provided with the unit.

Caution

*Be sure to connect the power cords to the distribution panel as shown in [Figure 13](#). Improper wiring of the neutral conductor may cause damage to the disk array. To reduce the risk of a wrong connection, use a plug and socket that are approved for this disk array. It is your electrician's responsibility to select and install the proper plug.*

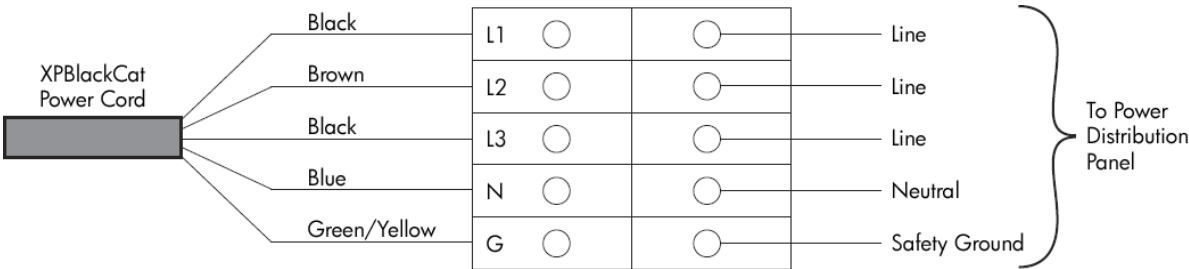


Figure 13. Three-phase power connections for Europe

When connecting to 380 to 415 volt service, a WYE configuration with neutral and ground conductors (in addition to the three-phase wires, for a total of five wires) is required.



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**Warning**

High leakage current can occur between the power supply and the unit. To avoid electrical shock, be sure to make the protective earth connection before the supply connections.

---

## Branch circuit requirements

When the supplied line to line voltage is in the 380 to 415 volt range, the connection must be a five-wire WYE or STAR connection.

To protect the disk array, your building must be wired correctly. Each supply (“hot”) conductor must be protected by a short-circuit protective device and by an overcurrent protective device. Table 25 ([page 71](#)) and Table 28 ([page 72](#)) provide specifications for the overcurrent protective devices required for three-phase operation.

All protective devices must comply with national standards of the country where the units are to be installed. If a protective device interrupts a supply conductor, it must also interrupt all other supply conductors.

Overcurrent protection is also required for the neutral conductor.

---

## Single-phase AC cabling for the USA

When configured for 50-amp, single-phase power, each XP12000 disk array cabinet has two power cords and two main disconnect devices so that AC power can be supplied from separate power distribution panels. When configured for 30-amp, single-phase power, each XP12000 disk array cabinet has four power cords and four main disconnect devices.

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**Caution** *An HP representative should be present whenever the disk array is being connected to a new power source for the first time.*

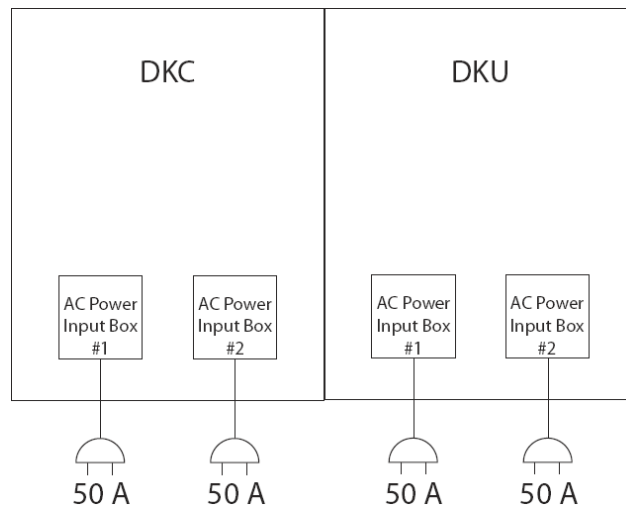
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### Connecting the power-supply cords

The XP12000 can be factory-configured for 50-amp or 30-amp, single-phase power.

#### 50-amp, single-phase power

Each 50-amp XP12000 disk array cabinet has two power-supply cords with attachment plug type Russellstoll 9P53U2.



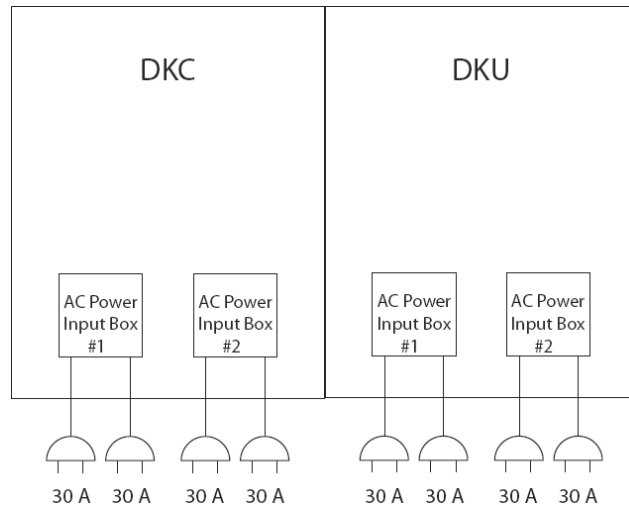
*Figure 14. 50-amp, single-phase power cords*

Be sure to install Russellstoll 9C53U2 or 9R53U2W socket receptacles between the power distribution panel of the building and the power plugs for the unit.

The power cords provided with the disk array are nonshielded, type ST or equivalent with three #6 AWG (minimum) conductors terminated at one end with an assembled 9C53U2 plug connector.

### 30-amp, single-phase power

Each 30-amp XP12000 disk array cabinet has four power-supply cords with attachment plug type Russellstoll 3750DP.



*Figure 15. 30-amp, single-phase power cords*

Be sure to install Russellstoll 3933 (alternate, 9C33U0) or 3753 (alternate, 9R33U0W) socket receptacles between the power distribution panel of the building and the power plugs for the unit.

The power cords provided with the disk array are nonshielded, type ST or equivalent with three #10 AWG (minimum) conductors terminated at one end with an assembled plug connector.

## Branch circuit requirements

To protect the disk array, your building must be wired correctly. Each supply (“hot”) conductor must be protected by a short-circuit protective device and by an overcurrent protective device. Table 23 ([page 70](#)), Table 24 ([page 70](#)), Table 26 ([page 71](#)), and Table 27 ([page 72](#)) provide specifications for the overcurrent protective devices required for single-phase operation.

All protective devices must comply with national standards of the country where the units are to be installed. If a protective device interrupts any supply conductor, it must also interrupt all other supply conductors.

*Note* In many cases, local codes do not allow a branch circuit fitted with a 50-amp receptacle or connector to be protected by an overcurrent-protection device with a rating lower than 50 amps. You can order the XP12000 disk array with the 30-amp power option to comply with these local codes. Your electrician knows the appropriate code requirements for your location/site.



# Single-phase cabling for Europe

When configured for 50-amp, single-phase power, each XP12000 disk array cabinet has two power cords and two main disconnect devices so that AC power can be supplied from separate power distribution panels. When configured for 30-amp, single-phase power, each XP12000 disk array cabinet has four power cords and four main disconnect devices.

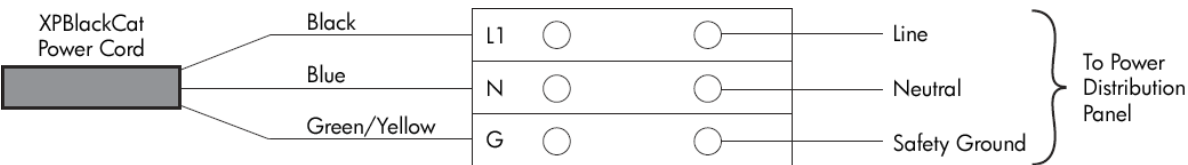
**Caution** *An HP representative should be present whenever the disk array is being connected to a new power source for the first time.*

## Connecting the power-supply cords

### 50-amp power cords

Each 50-amp XP12000 disk array cabinet has two power-supply cords. The power cords included with the unit are type H07RN-F or equivalent with three 10 mm<sup>2</sup> conductors.

**Caution** *Be sure to connect the power cords to the distribution panel as shown in [Figure 16](#). Improper wiring of the neutral conductor may cause damage to the disk array. To reduce the risk of a wrong connection, use a plug and socket that are approved for this disk array. It is your electrician's responsibility to select and install the proper plug.*



*Figure 16. Single-phase power connections for Europe*

## 30-amp power cords

Each 30-amp XP12000 disk array cabinet has four power-supply cords. The power cords included with the unit are type H07RN-F or equivalent with three 6 mm<sup>2</sup> conductors.

**Caution** *Be sure to connect the power cords to the distribution panel as shown in [Figure 16](#). Improper wiring of the neutral conductor may cause damage to the disk array. To reduce the risk of a wrong connection, use a plug and socket that are approved for this disk array. It is your electrician's responsibility to select and install the proper plug.*



### Warning

High leakage current can occur between the power supply and the unit. To avoid electrical shock, be sure to make the protective earth connection before the supply connections.

## Branch circuit requirements

To protect the disk array, your building must be wired correctly. Each supply (“hot”) conductor must be protected by a short-circuit protective device and by an overcurrent protective device. Table 23 ([page 70](#)), Table 24 ([page 70](#)), Table 26 ([page 71](#)), and Table 27 ([page 72](#)) provide specifications for the overcurrent protective devices required for single-phase operation. All protective devices must comply with national standards of the country where the units are to be installed. If a protective device interrupts any supply conductor, it must also interrupt all other supply conductors.

Overcurrent protection is also required for the neutral conductor.

*Note* In many cases, local codes do not allow a branch circuit fitted with a 50-amp receptacle or connector to be protected by an overcurrent-protection device with a rating lower than 50 amps. You can order an XP12000 disk array with the 30-amp power option to comply with these local codes. Your electrician knows the appropriate code requirements for your location/site.

---

## Glossary

|                    |   |
|--------------------|---|
| <b>ACP</b>         | Array control processor. The ACP handles the passing of data between the cache and the physical drives held in the DKUs. ACPs work in pairs, providing a total of eight SCSI buses. Each SCSI bus associated with one ACP is paired with a SCSI bus on the other ACP pair element. In the event of an ACP failure, the redundant ACP takes control. Both ACPs work together sharing the load. |
| <b>AL</b>          | Arbitrated loop.  |
| <b>AL-PA</b>       | Arbitrated loop physical address.   |
| <b>allocation</b>  | The ratio of allocated storage capacity versus total capacity as a percentage. “Allocated storage” refers to those LDEVs that have paths assigned to them. The allocated storage capacity is the sum of the storage of these LDEVs. Total capacity refers to the sum of the capacity of all LDEVs on the disk array.  |
| <b>array group</b> | The number of physical disk drives contained in a RAID group. This number depends on the RAID configuration. For example, there can be two or four physical disks in a RAID1 group. There are four physical disks in a RAID5 group.   |
| <b>BC</b>          | The HP StorageWorks Business Copy XP software program, which enables you to maintain up to nine internal copies of logical volumes on the disk array.   |
| <b>BS</b>          | Basic supply.   |
| <b>BTU</b>         | British thermal unit.   |
| <b>°C</b>          | Degrees centigrade/Celsius.   |

|  |   |
|--|---|
| <b>C-Track</b>                                 | The HP StorageWorks Continuous Track XP software program, which detects internal hardware component problems on a disk array and automatically reports them to the HP STC.  |
| <b>CA</b>                                      | The HP StorageWorks Continuous Access XP software program, which enables you to create and maintain duplicate copies of the data store on a local disk array.   |
| <b>ca</b>                                      | Cache.  |
| <b>cache</b>                                   | <p>Very high speed memory that is used to speed I/O transaction time. All reads and writes to the XP array family are sent to the cache. The data is buffered there until the transfer to/from physical disks (with slower data throughput) is complete.</p> <p>The benefit of cache memory is that it speeds I/O throughput to the application. The larger the cache size, the greater amount of data buffering can occur and the greater throughput to the applications.</p> <p>XP arrays support a range of cache memory. In the event of power loss, battery power allows the contents of the cache boards to survive for up to 48 hours.</p> |
| <b>CDE</b>                                     | Common desktop environment.   |
| <b>CE</b>                                      | Customer engineer.  |
| <b>CFW</b>                                     | Cache fast write.   |
| <b>CH</b>                                      | Channel.  |
| <b>channel adapter (CHA)</b>                   | The channel adapter (CHA) provides the interface between the disk array and the external host system. Occasionally this term is used synonymously with the term channel host interface processor (CHIP).  |
| <b>channel host interface processor (CHIP)</b> | Synonymous with the term channel adapter (CHA).   |
| <b>channel processor (CHP)</b>                 | The processors located on the channel adapter (CHA).  |
| <b>CHPID</b>                                   | Channel path identifier.  |

|                                     |   |
|-------------------------------------|---|
| <b>CKD</b>                          | Count key data.   |
| <b>CL</b>                           | Cluster.  |
| <b>command device</b>               | A volume on the disk array that accepts CA or BC control operations which are then executed by the disk array.  |
| <b>configuration file</b>           | A file that defines the pair configurations.  |
| <b>consistency group ID (CTGID)</b> | The group identifier for which the disk array guarantees the sequence of asynchronous data transfer for the asynchronous CA volume group.   |
| <b>control unit</b>                 | To organize the storage space attached to the DKC, you can group similarly configured logical devices (LDEVs) with unique control unit images (CUs). CUs are numbered sequentially. The disk array supports a certain number of CUs, depending on the disk array model. Each CU can manage multiple LDEVs. Therefore, to uniquely identify a particular LDEV requires both the CU number and the LDEV number. |
| <b>CSA</b>                          | Canadian Standards Association.   |
| <b>CU</b>                           | Control unit.   |
| <b>CVS</b>                          | Custom volume size (also called virtual LVI).   |
| <b>daemon</b>                       | A process that runs in the background and performs a specific operation at predefined times in response to certain events.  |
| <b>DASD</b>                         | Direct access storage device.   |
| <b>DCR</b>                          | Dynamic cache residency.  |
| <b>DE</b>                           | HP StorageWorks Data Exchange XP.   |
| <b>DFDSS</b>                        | Data Facility Dataset Services.   |
| <b>DFSMS</b>                        | Data Facility System Managed Storage.   |
| <b>DFW</b>                          | DASD fast write.  |
| <b>disk adapter (DKA)</b>           | Synonymous with the term ACP.   |
| <b>disk control frame (DKC)</b>     | The disk control frame (DKC) refers to the array hardware that houses the channel adapters and service processor (SVP).   |

|   |  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
|---|--|---------|---------|---------|---------|---------|---------|---------|----------|---------|--------------------------|---------|-------|--------|--------------------------|---------|--------------------------|
| <b>disk array frame (DKU)</b>               | The disk array frame (DKU) refers to the array hardware that houses the physical disks in the array.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>disk recovery and restore unit (DRR)</b> | The unit located on the ACP that is responsible for data recovery and restoration in the event of a cache failure.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>disk group</b>                           | The physical disk locations associated with a parity group.  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>disk type</b>                            | The manufacturing label burned into the physical disk controller firmware. In most cases, the disk type is identical to the disk model number.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>DMP</b>                                  | Dynamic multipathing.  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>dr</b>                                   | Drive.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>DSF</b>                                  | Device support facilities.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>DW</b>                                   | Duplex write.  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>DWL</b>                                  | Duplex write line.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>ECKD</b>                                 | Extended count key data.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>EFS</b>                                  | The IRIX standard file system.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>emulation modes</b>                      | <p>The logical devices (LDEVs) associated with each RAID group can have one of the following emulation modes. These modes change the behavior of the disks and determine their size.</p> <table> <tr> <td>OPEN-3:</td><td>2.46 GB</td></tr> <tr> <td>OPEN-8:</td><td>7.38 GB</td></tr> <tr> <td>OPEN-9:</td><td>7.42 GB</td></tr> <tr> <td>OPEN-E:</td><td>13.56 GB</td></tr> <tr> <td>OPEN-K:</td><td>Not available on XP12000</td></tr> <tr> <td>OPEN-L:</td><td>36 GB</td></tr> <tr> <td>OPEN-M</td><td>Not available on XP12000</td></tr> <tr> <td>OPEN-V:</td><td>User-defined custom size</td></tr> </table> | OPEN-3: | 2.46 GB | OPEN-8: | 7.38 GB | OPEN-9: | 7.42 GB | OPEN-E: | 13.56 GB | OPEN-K: | Not available on XP12000 | OPEN-L: | 36 GB | OPEN-M | Not available on XP12000 | OPEN-V: | User-defined custom size |
| OPEN-3:                                     | 2.46 GB  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-8:                                     | 7.38 GB  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-9:                                     | 7.42 GB  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-E:                                     | 13.56 GB   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-K:                                     | Not available on XP12000   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-L:                                     | 36 GB  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-M                                      | Not available on XP12000   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| OPEN-V:                                     | User-defined custom size   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>EOF</b>                                  | End of field.  |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>EPO</b>                                  | Emergency power-off.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |
| <b>EREP</b>                                 | Error reporting.   |         |         |         |         |         |         |         |          |         |                          |         |       |        |                          |         |                          |

|                     |  |
|---------------------|--|
| <b>ESA</b>          | Enterprise Systems Architecture.   |
| <b>ESCON</b>        | Enterprise System Connection (the IBM trademark for optical channels).   |
| <b>expanded LUN</b> | A LUN is normally associated with only a single LDEV. The LUSE feature allows a LUN to be associated with 1 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access a single large pool of storage. The LUSE feature is available when the HP StorageWorks LUN Configuration Manager product is installed. |
| <b>ExSA</b>         | Extended serial adapter.   |
| <b>failover</b>     | Disconnecting a failed portion and replacing it with another normal portion or alternative portion in order to continue functioning.   |
| <b>°F</b>           | Degrees Fahrenheit.  |
| <b>FAL</b>          | File access library (part of the Data Exchange software).  |
| <b>FBA</b>          | Fixed-block architecture.  |
| <b>FC</b>           | Fibre Channel.   |
| <b>FC-AL</b>        | Fibre Channel arbitrated loop.   |
| <b>FCC</b>          | Federal Communications Commission.   |
| <b>FCP</b>          | Fibre Channel Protocol.  |
| <b>FCU</b>          | File conversion utility (part of the Data Exchange software).  |
| <b>FDR</b>          | Fast dump/restore.   |
| <b>fence level</b>  | A level for selecting rejection of a write I/O request from the host according to the condition of mirroring consistency.  |
| <b>F/M</b>          | Format/message.  |
| <b>ft.</b>          | Foot or feet.  |
| <b>FWD</b>          | Fast wide differential.  |
| <b>fx</b>           | The IRIX disk utility.   |
| <b>GB</b>           | Gigabytes.   |

|                    |  |
|--------------------|--|
| <b>GLM</b>         | Gigabyte link module.  |
| <b>HA</b>          | High availability.   |
| <b>HBA</b>         | Host bus adapter.  |
| <b>HCD</b>         | Hardware configuration definition.   |
| <b>HORCM_CMD</b>   | A section of the RAID Manager instance configuration file that defines the disk devices used by RAID Manager to communicate with the disk array.   |
| <b>HORCM_DEV</b>   | A section of the RAID Manager instance configuration file that defines the volumes of the instance.  |
| <b>HORCM_INST</b>  | A section of the RAID Manager instance configuration file that defines how RAID Manager groups link to remote RAID Manager instances.  |
| <b>HORCM_MON</b>   | A section of the RAID Manager instance configuration file that defines the instance you are configuring.   |
| <b>host mode</b>   | Each port can be configured with various options referred to as host modes. These modes are represented as two-digit hexadecimal numbers. The first digit, usually 0, represents different things on different arrays. The second hex digit represents the host system type. For example, the 8 in mode 08 represents an HP-UX host. |
| <b>hot standby</b> | Using two or more servers as a standby in case of a primary server failure.  |
| <b>HP</b>          | Hewlett-Packard Company.   |
| <b>H/W</b>         | Hardware.  |
| <b>Hz</b>          | Hertz.   |
| <b>ICKDSF</b>      | A DSF command used to perform media maintenance.   |
| <b>IDCAMS</b>      | Access method services (a component of Data Facility Product).   |
| <b>IML</b>         | Initial microprogram load.   |
| <b>in.</b>         | Inches.  |
| <b>I/O</b>         | Input/output (applies to an operation or device).  |
| <b>IOCP</b>        | Input/output configuration program   |



|                       |  |
|-----------------------|--|
| <b>instance</b>       | An independent copy of RAID Manager. Instances are local or remote and can run on the same host.   |
| <b>JCL</b>            | Job control language.  |
| <b>KB</b>             | Kilobyte.  |
| <b>kcal</b>           | Kilocalorie.   |
| <b>kg</b>             | Kilogram.  |
| <b>km</b>             | Kilometer.   |
| <b>kVA</b>            | Kilovolt-ampere.   |
| <b>kW</b>             | Kilowatt.  |
| <b>LAN</b>            | Local area network.  |
| <b>lb.</b>            | Pound.   |
| <b>LCP</b>            | Local control port.  |
| <b>LD, LDEV</b>       | Logical device. An LDEV is created when a RAID group is carved into pieces according to the selected host emulation mode (that is, OPEN-3, OPEN-8, OPEN-9). The number of resulting LDEVs depends on the selected emulation mode. The term LDEV is often used synonymously with the term volume. |
| <b>LED</b>            | Light emitting diode.  |
| <b>local disk</b>     | A local disk in the host.  |
| <b>local instance</b> | The instance currently being configured or the instance to which commands are issued.  |
| <b>LPAR</b>           | Logical partition.   |
| <b>LCP</b>            | Link control processor or local control port.  |
| <b>LRU</b>            | Least recently used.   |
| <b>LU</b>             | Logical unit.  |

|                                  |   |
|----------------------------------|---|
| <b>LUN</b>                       | Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV, and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB. |
| <b>LUSE</b>                      | Logical unit size expansion.  |
| <b>LVI</b>                       | Logical volume image.   |
| <b>LVM</b>                       | Logical Volume Manager.   |
| <b>LVM mirror</b>                | A disk duplicating function provided by Logical Volume Manager (LVM) (capable of triplicating disks).   |
| <b>m</b>                         | Meters.   |
| <b>MB</b>                        | Megabytes.  |
| <b>MCU</b>                       | Main control unit.  |
| <b>mirroring consistency</b>     | The consistency (usability) of data in a volume (for example, S-VOL).   |
| <b>mm</b>                        | Millimeters.  |
| <b>MP</b>                        | Microprocessor.   |
| <b>MPLF</b>                      | Multipath Locking Facility.   |
| <b>MR</b>                        | Magnetoresistive.   |
| <b>ms, msec</b>                  | Milliseconds.   |
| <b>mutual hot standby system</b> | Two servers that are poised to cover for each other if necessary.   |
| <b>MVS</b>                       | Multiple Virtual Storage (including MVS/370, MVS/ESA, MVS/XA).  |
| <b>NHAS</b>                      | Novell High Availability Server.  |
| <b>node</b>                      | Logically speaking, an environment where instances can be executed. Physically, a processor, which is an element of a cluster system.   |
| <b>NVS</b>                       | Nonvolatile storage.  |

|                     |  |
|---------------------|--|
| <b>OFC</b>          | Open Fibre Control.  |
| <b>OLM</b>          | Optical link module.   |
| <b>ORM</b>          | Online read margin.  |
| <b>OS</b>           | Operating system.  |
| <b>P/DAS</b>        | PPRC/dynamic address switching.  |
| <b>PA</b>           | Physical address.  |
| <b>parity group</b> | A parity group is a mode of disk operation and configuration. It is synonymous with the term RAID group.   |
| <b>partition</b>    | Dividing a specific physical disk according to the HP-UX kernel or device driver layer into two or more areas as if there are two or more physical disks.  |
| <b>path</b>         | Paths are created by associating a port, a target, and a LUN ID to one or more LDEVs.  |
| <b>PCI</b>          | Power control interface or peripheral component interconnect.  |
| <b>PM</b>           | HP StorageWorks Performance Manager XP software.   |
| <b>port</b>         | <p>The number of supported ports on an XP disk array depends on the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of disk arrays supports SCSI, Fibre Channel (FC/AL), ESCON, and FICON I/O interfaces. <i>I/O support can vary with the selected disk array.</i></p> <p>Ports are named based upon their port group and port letter. Examples of port names include CL1-A through CL1-R and CL2-A through CL2-R (letters I and O are skipped).</p> |
| <b>P-P</b>          | Point-to-point.  |
| <b>PPRC</b>         | Peer-to-peer remote copy.  |
| <b>PS</b>           | Power supply.  |
| <b>P-VOL</b>        | The primary or main volume that contains the data to be copied.  |

|                                       |  |
|---------------------------------------|--|
| <b>RS</b>                             | Russellstoll <sup>®</sup> , a brand of electrical plugs and receptacles manufactured by Thomas & Betts Corporation.  |
| <b>RAID</b>                           | Redundant array of inexpensive disks.  |
| <b>RAID Group</b>                     | <p>A RAID group is a mode of disk operation and configuration. RAID groups 1 to 5 vary in the number of bits used in data/parity encoding, mirroring, and striping features.</p> <p>Occasionally, the term <i>parity group</i> is used synonymously with RAID group.</p> |
| <b>RAM</b>                            | Random access memory.  |
| <b>remote instance</b>                | The instance to which the local instance communicates as configured in the HORCM_INST section of the RAID Manager instance configuration file.   |
| <b>RISC</b>                           | Reduced instruction set computer.  |
| <b>RM</b>                             | HP StorageWorks RAID Manager XP.   |
| <b>RM instance configuration file</b> | A file that defines the link between a volume and a RAID Manager instance. This file consists of four sections: HORCM_MON, HORCM_CMD, HORCM_DEV, and HORCM_INST.   |
| <b>R-SIM</b>                          | Remote service information message.  |
| <b>R/W, r/w</b>                       | Read/write.  |
| <b>S/390</b>                          | IBM System/390 architecture.   |
| <b>SAM</b>                            | System Administration Manager.   |
| <b>script file</b>                    | A file containing a shell script.  |
| <b>SCSI</b>                           | Small computer system interface.   |
| <b>sec.</b>                           | Second.  |
| <b>seq.</b>                           | Sequential.  |
| <b>SGI</b>                            | Silicon Graphics Incorporated.   |
| <b>shell script</b>                   | A command sequence executed by a UNIX shell.   |

|                      |   |
|----------------------|---|
| <b>Sidefile</b>      | An area of cache used to store the data sequence number, record location, record length, and queued control information before transmit over the ESCON link.  |
| <b>SIM</b>           | Service information message.  |
| <b>SMI-S</b>         | Storage Management Initiative Specification.  |
| <b>SMIT</b>          | System Management Interface Tool.   |
| <b>SMS</b>           | System managed storage.   |
| <b>SNMP</b>          | Simple Network Management Protocol.   |
| <b>special files</b> | Files that indicate physical devices and are different from regular files in the UNIX system. The functions of the device drivers (that is, access to system peripherals) become available through these special files. |
| <b>SSID</b>          | Storage subsystem identification.   |
| <b>STC</b>           | HP Storage Technology Center.   |
| <b>SVP</b>           | Service processor, which is the laptop PC that is built into the DKC. The SVP provides a direct interface into the disk array. <i>SVP use is reserved for HP support representatives only.</i>                          |
| <b>S-VOL</b>         | Secondary or remote volume. The copy volume that receives the data from the primary volume.   |
| <b>takeover</b>      | The actions of a standby server that takes over processing from the previously active server.   |
| <b>TB</b>            | Terabyte.   |
| <b>TCP/IP</b>        | Transmission control protocol/Internet protocol   |
| <b>TID</b>           | Target ID.  |
| <b>TPF</b>           | Transaction processing facility.  |
| <b>TSO</b>           | Time-sharing option (an IBM System/370 operating system option).  |
| <b>UCB</b>           | Unit control block.   |
| <b>UL</b>            | Underwriters' Laboratories.   |

|               |  |
|---------------|--|
| <b>VDE</b>    | Verband Deutscher Elektrotechniker.                        |
| <b>VM</b>     | Virtual machine (an IBM S/390 system control program).     |
| <b>VOLID</b>  | Volume ID.   |
| <b>volser</b> | Volume serial number.                                      |
| <b>Volume</b> | Synonymous with LDEV.                                      |
| <b>XRC</b>    | Extended Remote Copy.                                      |
| <b>VSE</b>    | Virtual Storage Extension (an IBM S/390 operating system). |
| <b>VTOC</b>   | Volume table of contents.                                  |
| <b>XA</b>     | System/370 Extended Architecture.                          |
| <b>XDF</b>    | Extended distance feature (for ExSA channels).             |
| <b>XF</b>     | IRIX extended file system.                                 |
| <b>XLV</b>    | Extended logical volume manager.                           |

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